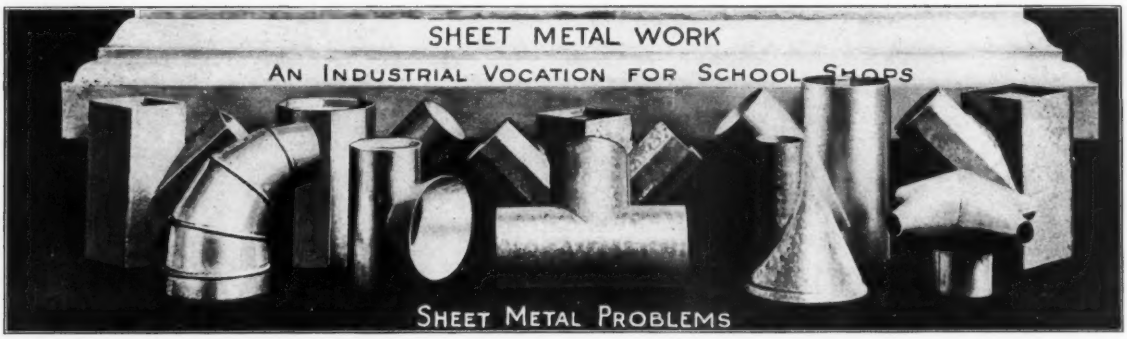
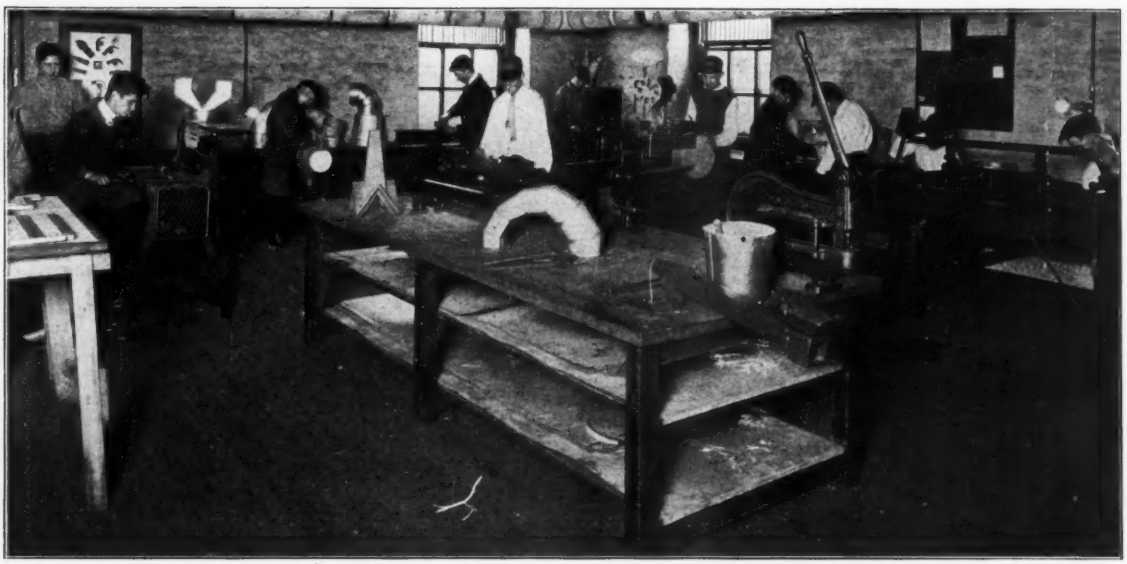
6972

The INDUSTRIAL-ARTS MAGAZINE

MAY - 1921

THE·BRUCE·PUBLISHING·COMPANY
MILWAUKEE — WISCONSIN





ONE of the Cincinnati Public School Shops, typical of many school shops from coast to coast who are successfully teaching the subject with the aid of Pexto equipment and the exclusive school service, it offers.

Sheet metal working for the High School or continuation schools has passed the experimental stage.

As a vocational subject it is rapidly advancing in favor and is considered greatly important to the School Supervision because our boys of today are living in a great age of steel.

Our Educational Department is preparing to plan and lay out your class rooms and furnish Benches, Tools and Machines all complete and ready for action. Text books to assist your instructors in teaching this subject are also offered.

PEXTO

Write for our vocational booklet "Sheet Metal Work an Industrial Vocation for School Shops." Free on request.

THE PECK, STOW & WILCOX CO.
Southington, Connecticut, U.S.A.

INDUSTRIAL-ARTS MAGAZINE

Volume X MAY, 1921 Number 5

Trade Tests, Their Construction, Use and Possibilities in Industry

G. G. Weaver, Instructor Vocational Teacher Training, University of Pittsburgh, formerly Employment Mgr. Delco-Light Co., Dayton, O.

AMONG the many results of the World Conflict we have the stimulus it has been to various activities in commercial life and especially to those forms of business pertaining to human relations. The methods pursued in the personnel departments of many up-to-date industrial concerns is an indication of the aftermath of the personnel division of the American Army. An integral part of this personnel work is trade tests.

To be sure those persons responsible for the hiring and placement of workers in industry have had some means of testing applicants, but it is safe to assert that in the formulation of their questions they were not guided by any definite fundamental principles. The questions which they gave were of such a nature as to permit vague and rambling replies, instead of clear and concise answers. Because of this one fault, with a number of others, the old types of questions have proven entirely inadequate for the selection of workers in a modern centralized employment office.

The introduction of trade tests into industry has met with a considerable amount of favor, probably due to the fact that the employment profession is in its infancy and the majority of employment managers are receptive to new ideas and methods.

Definition.

A trade test is either an oral or performance method of determining a person's proficiency in some particular kind of trade work.

Whether the test is of the oral or performance type, it should satisfy certain requirements.

First: It should indicate with considerable accuracy the grade of skill possessed by the person being tested.

Second: It must be concise and simple enough that any person of ordinary intelligence may make use of it to obtain satisfactory results after very little training.

Third: It must be constructed according to the practice of the trade in the particular community in which it is to be used.

Fourth: That it will test the ability possessed by the applicant at the time the test is given.

The trade test aims to test the man's trade skill or trade proficiency in the shortest possible time. We understand that trade proficiency consists of a mass of common trade knowledge in addition to the ability to perform the operations of the trade. It is the purpose of the trade test therefore, to ascertain the degree of this common knowledge possessed by the applicant. If the test is properly constructed it will surely detect whether or not an applicant is a tradesman, as well as his degree of trade skill.

Many people have been laboring under false impressions regarding trade tests, in that, they understand the test to be used for determining a person's inclination or aptitude to a certain trade. That is a decidedly erroneous belief, as the trade test claims in no way to test potentialities. It is not psychological in nature and therefore claims no power to make deductions regarding the person's aptitude or potential skill.

Construction of an Oral Trade Test.

In order to formulate a practical trade test it is absolutely necessary that you get in direct contact with the trade. Contrary to the thoughts of many, this job is decidedly not a desk or an academic job, but one involving the co-operation of tradesmen, foremen, educational departments and statisticians.

Altho various means have been employed in the building of trade tests, the following procedure has been used quite successfully and is to be recommended.

1. Ascertain by sufficient inquiry whether the work for which you desire to build a trade test exists as a distinct trade. Also determine whether there exists various grades of skill within the trade.

2. If the investigation indicates the possible testing of workers in that particular trade, information pertaining to the trade should then be collected. The sources of this information should be workers in the trade, foremen, trade journals, books on practical trade subjects, etc.

3. After the trade has been investigated and information collected and properly arranged, we should formulate our questions for a preliminary try-out. When planning the questions it is advisable to group them according to some definite order. A suggested order is as follows:

(a) Processes and operations.
(b) Tools and appliances.
(c) Machine parts and their respective functions.

The analysis of the trade into these general groups is entirely dependent on the content of the particular trade under consideration. In the majority of cases it lends considerable efficiency to the test if the questions are grouped according to some definite scheme.

4. In order that our questions may be effective the following points must be kept constantly in mind.

(a) The question must be phrased in absolute trade language which necessitates the elimination of theoretical and technical terminology.

(b) A question must be self-contended in order that no explanation be necessary by the interviewer.

(c) A question should be brief and unmistakably clear.

(d) A question should call for a short and definite answer.

(e) No catch questions should be used as we should deal only with good trade practice.

(f) It must not be a question that permits of an answer "yes" or "no." Any question with this possibility is of no value.

(g) It must not be a question which permits the one questioned to guess the correct answer. The question must be so phrased as not to indicate the answer.

(h) The questions should vary in their degree of difficulty from the simple to the most difficult in order to cover the range of skill from novice to expert.

(i) After the questions have been written and grouped according to the suggested plan each question should be followed by a tentative answer.

5. After step No. 4 has been completed the next step in the process is to give the questions a preliminary tryout. For the completion of this step we select men from the trade whose ability we already know and ask them the questions. The group selected should consist of about four men representing each of the four grades of skill existing in the trade: that is expert, journeyman, apprentice and novice. This preliminary tryout has several objectives:

(a) To eliminate any questions which are not good trade practice questions.

(b) To discover any questions which are not clearly understood and need re-construction.

(c) To establish standard answers.

(d) To determine whether the test covers the entire trade from the work of a novice to that of an expert.

(e) To ascertain the practicability of giving a trade test in this particular trade.

There is a considerable amount of technique involved in giving a trade test. This material will be presented, however not at this time.

6. After the questions have been re-written and arranged according to the suggestions above, the next step in the process is to test the questions (this is a very vital procedure as it would be disastrous to use the questions for selecting workers before the questions were tested). For the execution of this step we select a group of four to eight workers, (whose ability we already know) representing the different grades of skill in the trade (novice, apprentice, journeyman, expert). This tryout will prove especially valuable if special attention is given to the answers received in response to the questions, as well as, any comments or criticisms that may be volunteered.

The men used for this step are known tradesmen of varied grades of skill. Before giving them the test we should make note of their supposed status in the trade. This point is very valuable as this data is used in the calibration of the final test.

7. This tryout will form a basis for the final revision and will indicate several points:

(a) The question which is vague or impractical.

(b) The question which permits of a varied interpretation, resulting in a wide range of answers.

(c) Points out the questions which clearly test the various grades of skill.

(d) Whether the test is applicable to that particular trade.

8. After all deductions have been made from the try-out the succeeding step is to standardize the test. This work necessarily involves a fine degree of judgment and skill. It consists of giving the test to a fairly good sized group of persons engaged in the trade whose ability is known. By the means of this final tryout various things are revealed which should prove valuable to the establishment of standards for the rating of prospective employees.

Statistical Treatment of Results.

The common method of determining the relative value of each question is to plot the results on section paper. The number of questions used should not exceed eight to fifteen as it is to be remembered that the trade test to be practical in industry, must consume the minimum amount of time.

A typical trade test is one in which all questions can be answered by an expert, the majority answered by a journeyman, a few correctly answered by an apprentice and practically none answered by a novice. This particular situation may never exist, however there are times when the results closely approximate the above situations.

As stated above, the plotting of the results will indicate the typical expert, journeyman, apprentice and novice respectively. It is necessary to evaluate the questions and select eight to fifteen questions from the entire lot which will cover the range of skill which we hope to test.

Remembering that the trade status of the men used in establishing the standards was known, it is clearly evident that any question which is answered by more novices than apprentices or more journeymen than experts is decidedly a poor trade question and therefore should be placed in the discard.

9. After we have decided on the questions which should be included in the final tests as a consequence of our plotting the results, the test must be calibrated. This step consists in the establishment of scores which

indicate an expert, journeyman, apprentice and novice. In order to set up these standards or scores it is necessary to refer to the scores made on these selected questions by the men whose ability we knew and who were used to evaluate the test.

It is possible that a good apprentice will score the same or close to that of a low journeyman. Some journeyman may score the same as a low expert. Such a condition is not a serious one as certain over-lapping is sure to occur. After the completion of the work to this point the test is ready for use in the employment office for the purpose of testing prospective employees.

The following is a trade test formulated and standardized by the writer and used in testing applicants for the job of punch press operator in a large industrial plant of the Middle West. This test passed thru the progressive steps as indicated in the forepart of this article.

Sample Test for Punch Press Operator.

1. Q. What is it that prevents the bar of sheet metal from lifting with the punch?
   A. Stripper plate. Score 4.
2. Q. Name two things sometimes provided on a die to assist in keeping the stock located while punching.
   A. Set-edge.
   Finger stop.
   Gage.
   Guide pins.
   Stripper plate. Any two, Score 4.
3. Q. What two things usually hold the die?
   A. Bolts.
   Clamps.
   Set screws.
   Stops. Any two, Score 4.
4. Q. What type of die is used for cutting off pieces from a bar?
   A. (1) Shearing. Score 4.
   (2) Cut-off. Score 4.
5. Q. By what process is the "wire edge" removed from the blanks after leaving the press?
   A. Rattling (tumbling). Score 4.
6. Q. Name the instrument used on a punch press to indicate the number of punchings.
   A. Counter. Score 4.
7. Q. What effect has the punching operation on the copper?
   A. Harden (warp) (stiffen). Score 4.
8. Q. With what is the stock usually fed into the punch press?
   A. (1) Hand. Score 4.
   (2) Roll feed. Score 4.
   (3) Automatic. Score 4.
9. Q. From which side does the operator usually feed his stock?
   A. Right. Score 4.
10. Q. What advantage has the inclined press?
    A. Lets stock get away quicker. Score 4.
11. Q. What part of the punch press causes the ram to move up and down?
    A. (1) Driving shaft. Score 4.
    (2) Crank shaft. Score 4.
    (3) Eccentric shaft. Score 4.
12. Q. What will the punch press do if the clutch sticks?
    A. (1) Repeat. Score 4.
    (2) Double trip. Score 4.
13. Q. How is the size of the punch press specified?
    A. (1) Number. Score 4.
    (2) Stroke. Score 4.
14. Q. What will happen to the punch if oil is not used on the stock?
    A. Gall. Score 4.

Rating the Candidate.

Score	Rating
8 and below	N
10, 12 and 14	A
16 and 18	A plus
20 to 32 inclusive	J
34 to 36	J plus
38 to 50 inclusive	E
52 and above	E plus

Using Trade Tests.

Altho you may have a good test as a result of closely following all rules pertaining to the formulation and standardization of trade tests, its success depends to a major degree on the examiner and the manner in which he gives the test.

Some of the pre-requisites of a good examiner are a pleasing personality, businesslike methods and tact. It must be assumed that the applicant is more or less disturbed when applying for a position, and especially if he realizes he is to take a test. It is therefore the examiner's job to set the applicant at ease by his manner of greeting the applicant and introducing him to the test. The examiner, in his conversation with the applicant, should at no time use the word TEST if possible to eliminate it.

It is advisable to briefly state to the applicant that you propose to ask him a few questions, for example: "Mr. Smith, I have a few questions I wish to ask you about your trade, before I am able to tell what kind of a job we can offer you. I might tell you that no catch questions are included, but only such questions as pertain to actual work in your trade. Take your time and think carefully before answering. I prefer that you give short answers."

The examiner should exercise a familiar and pleasant attitude to the applicant thruout the interview and carefully observe the following points.

1. To ask the questions exactly as they are indicated on the test.
2. Speak slowly and distinctly.
3. Refrain from the use of gestures of any kind which might assist the applicant.
4. Do not show your approval or disapproval of an answer. Failure to observe this point may result in assistance to the applicant.
5. Refrain from prompting the applicant in any way. If the applicant asks a question about the original question, merely state "I am sorry, Mr. Smith, I can't answer your question, but I will repeat the original question."

One or more answers are given to each question for the convenience of the examiner. As a rule there is a key word in the answer to each question and the trained examiner will detect that key word, altho it may be supplemented with an extended explanation. Ofttimes the applicant will give the answer, but will want to tell you almost his entire trade experience. In such cases the examiner must exercise special tact in limiting the discourse without offense to the applicant.

Each question is given a value. In this case, four points. The applicant's total score indicates his trade status. The scores at the end of the sample test indicate the results of the original calibration, and by refer-

ence to these scores it is possible to establish the applicant's trade status.

Trade Tests in Industry.

The trade test is but a refinement and a standardization of the crude methods formerly used in industrial and commercial establishments for detecting the applicant's fitness for employment in that particular organization.

Such tests may be and are utilized in part or in all of the following situations:

1. Hiring new workers.
2. Promotion of employees to jobs of greater skill.
3. Selection of men for special training.
4. Transferring men due to changing labor conditions, change in production schedule, ambition of the employees, or unfit adjustment of men to their present jobs.
5. Emergency substitutions.

There has been a considerable amount of skepticism surrounding the introduction of trade tests in industry. To be sure, it is a perfectly natural reaction which accompanies anything that is more or less revolutionary in character. After realizing the various steps thru which the material must pass before being used as a test, it seems logical to expect the most practical minded folks to accept trade tests as a big step forward. That trade tests have decided limitations is a certainty. However, the obtaining of more definite, more objective and more permanent standards of trade skill for the placement of all employees stands out as a project of merit which will repay to employers and employees a considerable amount in terms of time and effort. The practical limits to the application of trade tests are yet undetermined and will depend in part at least on the attitude of the man having jurisdiction over this piece of research work. Many of the trade tests which were used with a high degree of success in the army are probably not immediately applicable to industry. That the general method employed in making the army tests can be applied in industry with little change, seems quite certain.

The comparative newness and the lack of knowledge of trade tests necessitates quite a bit of educational work among shop executives where it is hoped to introduce these methods. The writer arranged for numerous personal interviews for each of the shop executives and supplemented these interviews by literature on the subject which was finally followed by using one of the army tests on each of the executives. This method of procedure in introducing the subject to the executives of the organization, established the foundation for co-operation in the development of the tests, and at the same time gave the executives an insight and a better knowledge of this phase of the personnel work. The results at times appealed to them as almost miraculous and tended to sell the proposition beyond its true worth.

Altho this procedure consumes a considerable amount of time and apparent delay in putting across the program, it is decidedly the advisable plan to follow. It is worthy of note that practically no difficulty was experienced in securing the hearty co-operation so necessary to the conducting of such a project, and much valuable information and data was volunteered by the executives.

Before attempting to recommend the use of trade tests it is necessary to make a thoro analysis of the various jobs that exist thruout an organization, and from a study of this data, it is possible to determine the following essential factors:

1. The practicability of a test in the particular trade or occupation.
2. The elements which require or permit of testing, that is, whether men can be graded in the occupation or trade according to degrees of skill. In some trades it will be found that the trade requires simply the performance of a single set of operations and there are no gradations among the members of the trade.
3. The kinds of tests that may be used. Some trades, such as truck driver and typist are mainly features of skill and for them only performance tests are practical. Other trades, however, such as maintenance occupations, inspectors, testors, etc., are chiefly matters of knowledge, in which case oral or picture tests are best adapted to these occupations.

The practicability of trade tests in any industry may be determined by several definite factors:

1. The amount of turn-over or the number of men hired for that occupation during a definite period.
2. The elements of the occupation which permit of test.
3. Whether the practices of the occupation are common thruout the community or the country.
4. The methods of training and promotion in that particular industry.

Summary.

In view of the foregoing discussion in regard to trade tests they may be considered from the standpoint of industry as follows:

1. As a means of preliminary tentative selection of men by the employment interviewers for a specific occupation in the factory provided the applicant claims to be a skilled tradesman.
2. As a means of testing folks after the completion of a training course provided by the industry in specialized processes and divisions of certain trades.
3. They may be considered impractical for jobs where loyalty, ability to learn, initiative, general character, etc., are essential factors.
4. They have greater possibilities in the more highly skilled trades than where the work is highly specialized and company operatives predominate.

In brief, they are but a *big step in the right direction.*

PAPER-FIBRE WEAVING

Walter K. Schmidt, Grand Rapids, Mich.

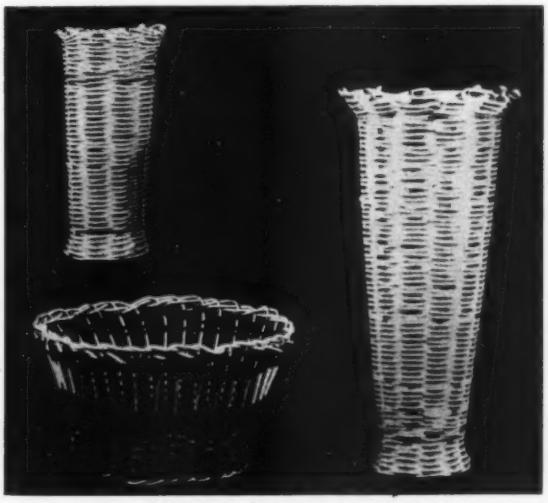
THE accompanying illustrations show a number of articles, such as baskets, stands, etc., the construction of which presents endless opportunities for school work.

They are constructed of paper-fibre, a material which doubtless is more or less familiar to all instructors of manual training. It is furnished in the round style, which is more common, and also in the flat form which has not been used so extensively. The round style is generally employed commercially for manufacturing chairs, settees, tables, etc. The flat cord is adaptable for shirt waist boxes, waste baskets, screens, flat lamp shades, etc.

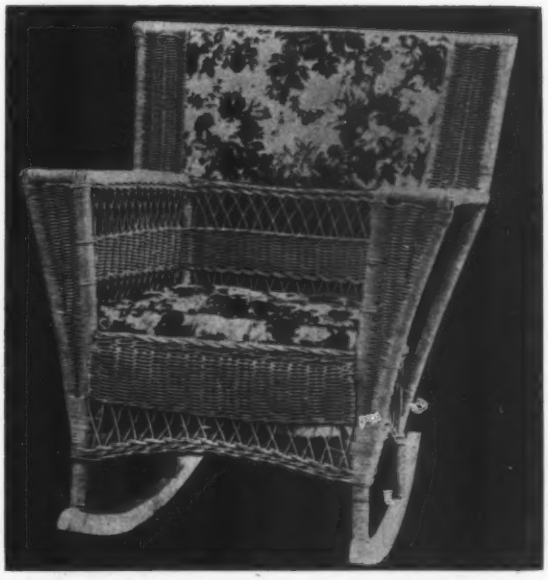
Any of the smaller articles can be easily made by any of the grade students, and in the higher grades the pupils will find much benefit from the construction of the larger pieces. The pieces are, in reality, simple to make, and when finished are very acceptable around any home.

In order to give the reader a general idea of the procedure to be followed, instructions follow for making a small basket, the size and form of which, can, of course, be varied to suit.

Figure 1 shows how the ribs or stakes of the basket are placed in position. The stakes consist of a tough, specially prepared paper, twisted by machinery around a wire center. You will then have ten long ones and one short one. This number can be varied, of course, but always be sure to have an uneven number of stakes. Tack them down to a board with double pointed tacks, which can be procured at any hardware store. After the stakes are tacked down, spread them out, as shown in Figure 2. You will then have 21 stakes. Start the weaving by placing one end of the fiber cord under one



TYPICAL BASKETS MADE OF PAPER FIBRE.



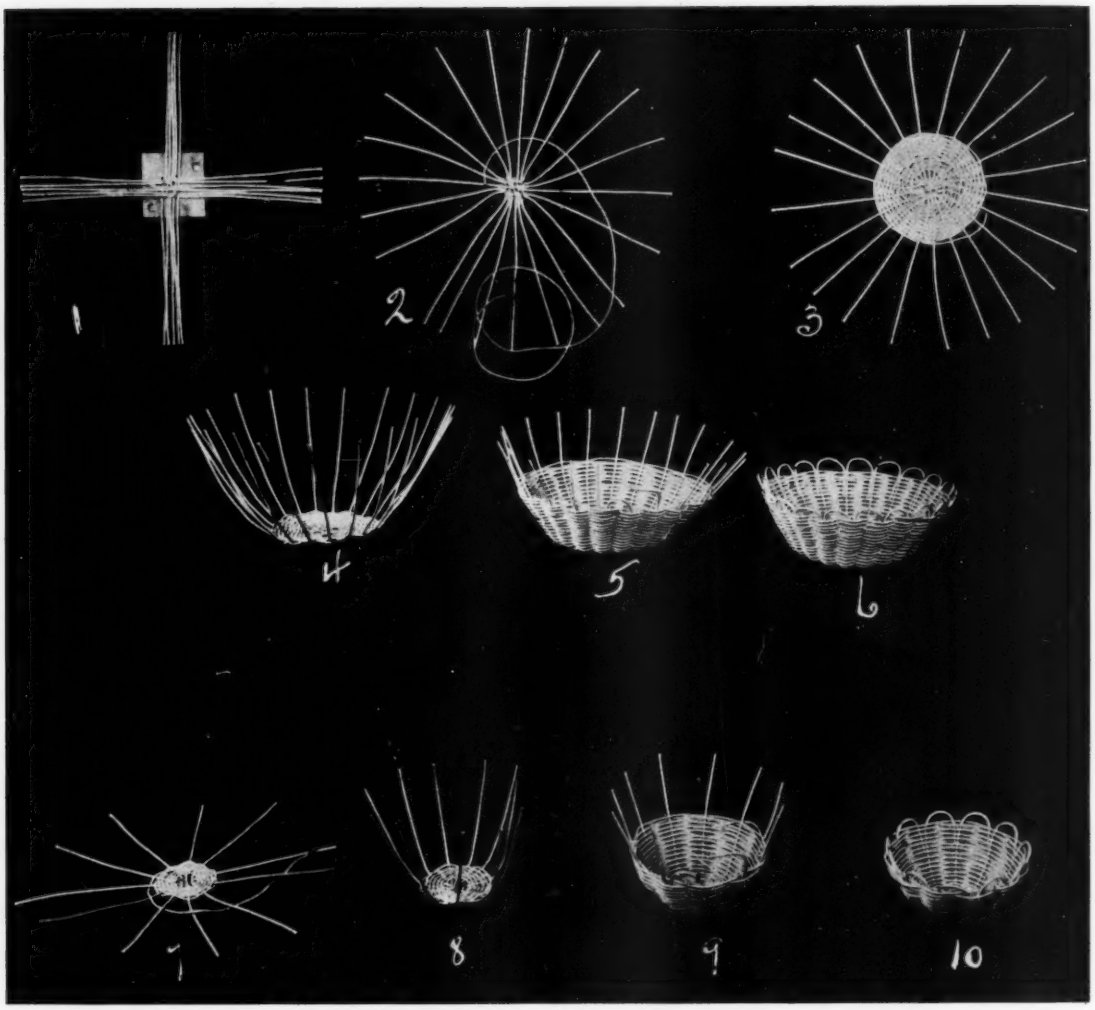
A COMMERCIAL USE OF PAPER FIBRE.

of the stakes and over the other, keeping the hand on the end you placed under the stake, until you have gone around two or three times, after which the cord will hold itself in position. Proceed in this manner, going over one and under the other until you have woven to a diameter of 5½ or 6 inches. Now, take a saucer, turn it upside down and weave to the edge of it, as in Figure 3.

The tacks are now removed and the basket turned over, placing the saucer under the part you have just woven as shown in Figure 4. Now continue the weaving to a distance of about three inches. Before cutting, be sure you have left enough of the fiber so it can be inserted behind the stakes, as in Figure 6. Trim the stakes so that they extend a distance of 3½ inches from the top of the basket, after which they are bent, as shown in Figure 5, and inserted one behind the other, using an awl or lead pencil to facilitate the operation.

Figure 6 shows the basket completed, which may be left plain or finished as desired. Water soluble stains can be used to stain the basket, the powder simply being dissolved in water, the basket dipped in the solution and left to dry. A coat of shellac or lacquer is then applied to protect the color and to add stiffness to the basket. Figures 7, 8, 9 and 10 are started in exactly the same manner as Figure 1, using less stakes, if a small basket is desired.

If the work is made up of white cord, the stain should be applied and allowed to dry before sizing. Oil and spirit stains should not be used. Oil stains penetrate unevenly, and spirit stains fade, largely due to



STEPS IN STARTING A BASKET WITH PAPER FIBRE.

the chemicals which are used in the manufacture of the paper from which the cord is made.

A sewing basket or a basket in which one would put a high priced vase, necessarily will be constructed along better lines. The weaving will all be securely fastened, and if done with the properly colored cord, needs no other staining, but merely finishing coats.

The finishing of the baskets presents an interesting problem, and a satisfactory finish may be produced by several methods. These are:

1.—Glue size.
2.—Caseine glue size.
3.—Lacquer.

The ordinary glue size has been used for years commercially and gives a very good finish at first, but it does not wear very well. In warm weather the glue is sticky and one must be careful not to touch the pieces with moist hands.

The glue gives a nice gloss to the work, and also aids in stiffening the basket, helping considerably to preserve its form and solidity.

Casein glue has been coming into favor lately as it is waterproof, and hence is not subject to the ailments of ordinary glue. Casein itself may also be used, and a very satisfactory size is made by using:

One pound casein.
Four ounces caustic soda.
One-half pound borax.
One gallon water.

This will make a very good dipping size. The quantities can be increased or decreased according to the requirements. It is understood, of course, that a dipping size is not as heavy as one that is brushed on. The advantage of a casein size is that it more or less waterproofs the fibre, then if the basket is used for vases, which oftentimes become wet from excess quantities of water, the fibre is not affected and resists the moisture, at the same time holding the finish better than ordinary glue.

Wood lacquer, however, is the ideal finish for this class of work. It is rather difficult to brush lacquer,

SOME ARTICLES OF WOVEN PAPER FIBRE.

but this material can easily be applied by dipping the small pieces. Larger ones can be brushed successfully, if the lacquer is reduced. A special thinner must be used, and for brushing 50 per cent wood lacquer and 50 per cent thinner will be found about right. The same proportion can be used for dipping also, altho this formula must be governed largely by the work in hand.

The wood lacquer stiffens the basket, and renders it waterproof, besides giving a satin-like finish that is a delight to the eye. We must here caution the reader against confusing wood lacquers with those lacquers that are commonly employed by the brass and metal industries. The metal lacquers are, as a rule entirely unsuited for the requirements of the finisher.

While excellent results can be obtained by brushing and dipping, the spray is the ideal method of applying the finishing coats. By this means, the lacquer or other material can be sprayed on in a smooth, even film, without showing any runs or sags. Every bit of the fibre can be easily covered, and also all the little pockets that are inaccessible to the brush.

The most popular shade is brown. While the Japanese brown produced with the spirit solution of Bismark Brown verges on the purplish mahogany color, it rather follows the shades of fumed oak. While it is understood that the brown produced with the spirit solution of Bismark Brown is a proper color for this kind of work, there is nothing undoubtedly more appropriate than a brown, ranging from a dark straw to the rich brown—almost seal in color.

Novelty finishes may also be obtained by "filling" the basket with a harmonizing shade of color before the final finishing coat is applied. Suppose we have finished a basket in ivory lacquer enamel. After it is dry, prepare a thin paste made of Burnt Sienna in oil, thinned with naptha, and with a little Japan dryer or varnish added for a binder. Now smear this mixture all over the outside of the basket. Let stand until it begins to set, and then wipe off the basket with a clean cloth. This will remove all the brown paste from the prominent surface of the basket, but all the depressions will have a tinge of brown. Many beautiful effects can be obtained in this manner.

PORCH FURNITURE MADE OF WOVEN PAPER FIBRE.

Shop Work in Continuation School Practical Art Classes

M. Norcross Stratton, Agent for Industrial Teacher-Training, Massachusetts Department of Education

WHAT to give the boys to do in the small continuation-school shop and how to carry on the work is a problem with many shop instructors. This is especially true in schools where only one activity—wood work—is offered. The following suggestions on the subject are made after five months of study and observation in many continuation schools and considerable first-hand experience in carrying on such work with similar groups in prevocational classes.

In many of the smaller communities the established manual training shops are used for continuation-school work. In some places new shops of a similar nature have been provided. Formerly many of the teachers either taught manual training in these same shops or in other places. Some of these teachers are using in the continuation school the same methods and the same "projects" that were or are used in the manual training in elementary schools. In some instances they are making the formal manual training models or exercises (the coat-hanger and taboret type) and a few are resorting to the "squaring-up-bits-of-wood" exercise method of the "dark ages" of manual training. Most of our continuation shop instructors realize that such work will not interest—and is of little value to the boys with whom they deal in continuation classes. These teachers are shaping their courses along more practical lines.

Woodwork does not appeal to all boys. A variety of work or simple work in a variety of materials, should be provided even in the small communities.

We have carefully refrained from suggesting any "courses" or any "series of projects." As in other innovations in school development, there is the grave danger that work in the continuation school will become formal and that the subject matter instead of the pupil will receive first consideration. We have therefore refrained from fixing attention upon "courses."

The shop instructor in the continuation school soon finds that he has a brand new problem on his hands. He discovers that he cannot interest the boys in the "same old thing they had before they left school." The individual project is almost impossible, as the shop must care for from ten to twenty classes a week. By the individual project method only a small portion of the work started would be in motion at any one time. This would result in much piling up of expensive material. Many boys leave before their projects are finished and then large quantities of partly finished and worthless articles would be stored away, broken up, or burned.

A class in a continuation school is made up of from ten to fifteen boys varying in age from 14 to nearly 16 years. They come from different schools, often different towns, with academic educational acquirement varying from that of the fourth grade to that of the first year of high school. Such a class often includes boys who have had manual training, practical arts training, or even some form of industrial training. There are boys now at work in all manner of occupations and trades. Considering all this it appears that the group-project method, often called the factory plan method, can best be adapted to the continuation school for beginners. Just now the boys are all beginners. This type of work should be carried on for all short term and intermediate term classes. Later the long-term boys who will remain in the woodworking shop may successfully be given individual problems.

The group projects selected should signify a real and worth-while need easily understood by, if not a real need of the boy—articles that may be sold or used in the school system. The workmanship should be "up-to-standard"—as near commercial standards as is possible with boys' productive work. The group project method interests the majority of boys more than any other method, provided each separate class carries its projects thru to completion. Boys like to participate in a community problem, they like to see a big job going thru, and they like to see it come out "as per specifications." These particular boys are working in industry and are used to seeing things done in a business-like way. Even the poor workman among them can point with pride to the completed job. "We made them" becomes their slogan. The group project plan develops teamwork and cooperation which help the boys at their employment and makes for better citizenship.

The objection is made that the method is excellent for the average boy, but not for the exceptional boy. He should be given extra attention. The exceptional boy may be interested if he is assigned work as a foreman or used to make jigs and templates.

The group-project plan requires fewer different

ASSIGNMENT CARD
and Time Card

Job #1 No. #2

Operation or Part #3

Date	Workman	No. Parts Completed	Time From	Time To	Total	Rating	Amt.
#4	#5	#6	#7	#7	#8	#9	#10
							(over)

FIG. 1. PUPILS' TIME CARD.

RECORD OF PROGRESS CHART

CLASS.
Day.....
Hours.....

Names of Students

Getting out Stock	Planing in Jig	Sawing in Jig	Sandpapering	Hand Planing	Use of Hand Saw	Boring	Joints	Gluing	Scraping	Wood Finish	Band Saw	Lathe	Surfacer	Buzz Planer	Circular Saw	Misc. Machines	Sharpening Tools	Toolroom	Individual Projects											

FIG. 2. FORM FOR RECORDING ASSIGNMENT OF WORK AND RECORD OF PROGRESS.

projects, less material, and offers a better opportunity to dispose of the product. With only one or two well planned projects going on in a group, the instructor is able to concentrate his efforts on giving instruction instead of looking after the details, supplies and problems of a dozen or more different articles. The instructor is able to plan his work so that each individual boy is given work within his capacity and ability and progresses from week to week.

Related work is much easier to manage and plan than it would be if individual projects were carried on. Projects should be made more difficult as time goes on, but even so, there will always be simple parts for the newcomer to work out.

During early weeks of the boys' experience in the shop it is well to use jigs. By using jigs, the boys are able to establish the proper apperceptive basis. They gain a conception of a good standard in workmanship and an idea of the amount of time a job should take. To the average boy a demonstration or a sample is not sufficient to give the necessary apperception. Many a boy's failure in shopwork has been due to lack of a proper apperceptive basis. A muscular sense in handling tools is developed because when a boy is planing and sawing in a jig, he is compelled to operate the tools as the jigs guide them and he acquires the habit of handling the tools properly. The boys gain confidence when they have successfully produced a first-class job.

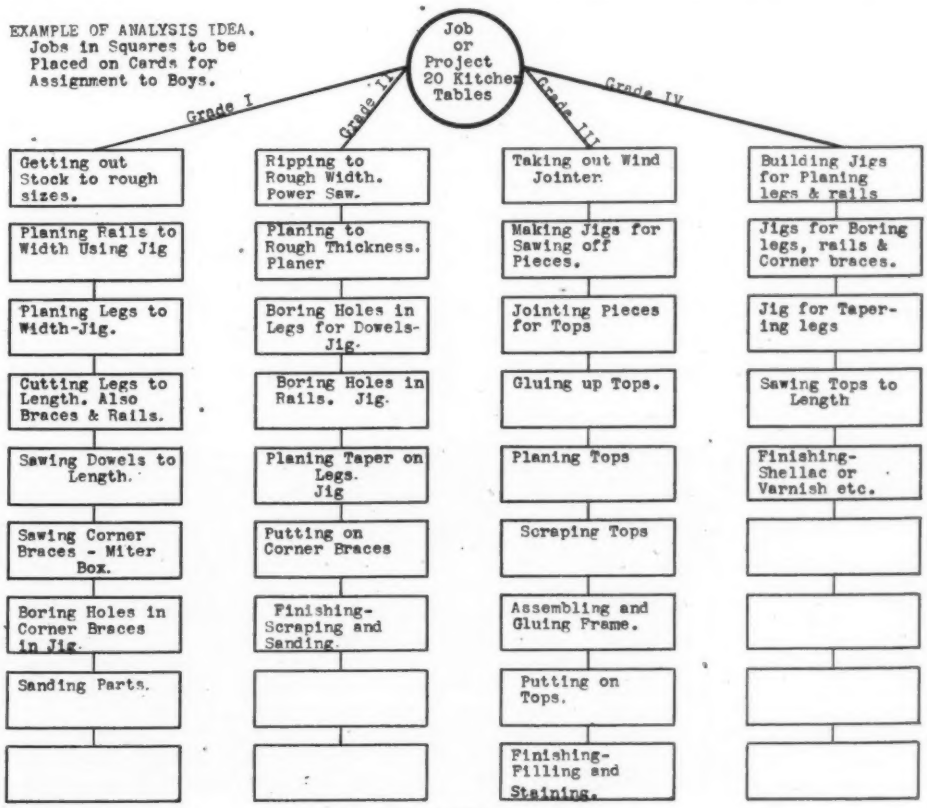

EXAMPLE OF ANALYSIS IDEA.
Jobs in Squares to be Placed on Cards for Assignment to Boys.
Job or Project 20 Kitchen Tables
Grade I
Grade II
Grade III
Grade IV
Getting out Stock to rough sizes.
Planing Rails to Width Using Jig
Planing Legs to Width-Jig.
Cutting Legs to Length. Also Braces & Rails.
Sawing Dowels to Length.
Sawing Corner Braces - Miter Box.
Boring Holes in Corner Braces in Jig.
Sanding Parts.
Ripping to Rough Width. Power Saw.
Planing to Rough Thickness. Planer
Boring Holes in Legs for Dowels-Jig.
Boring Holes in Rails. Jig.
Planing Taper on Legs. Jig
Putting on Corner Braces
Finishing-Scraping and Sanding.
Taking out Wind Jointer
Making Jigs for Sawing off Pieces.
Jointing Pieces for Tops
Gluing up Tops.
Planing Tops
Scraping Tops
Assembling and Gluing Frame.
Putting on Tops.
Finishing-Filling and Staining.
Building Jigs for Planing legs & rails
Jigs for Boring legs, rails & Corner braces.
Jig for Tapering legs
Sawing Tops to Length
Finishing-Shellac or Varnish etc.

FIG. 3. ANALYSIS OF A JOB.

It also gives them an idea of what high standards are. Jigs should be discontinued after the necessary preliminary experience.

To prevent loss of time in assigning work, some system should be devised to take care of this task. It is also necessary with so many different boys of varying ability to have some scheme for keeping a record of work done to insure progression. The following scheme has been used to particular advantage at the Westfield Vocational School:

At this school all projects are analyzed by the instructor before assigning work to the pupil and the operations divided into four groups, according to difficulty. The various operations or parts of the job are written on separate cards. The simplest operations are listed in Group I and written on yellow cards; those a little more difficult are listed in Group II and written on blue cards; those still more difficult are listed in Group III and written on green cards; the most difficult operations are listed in Group IV and written on white cards. These cards are given to the boys at the beginning of the period or placed in an assignment rack from which the boy secures his own card before the period begins. The beginners or least skilled boys are given jobs on yellow cards. The boys will be given jobs found on yellow cards until they become capable of doing work for the next grade. This method interests the boys, is an incentive for them to produce good work, and helps to enable the teacher to see at a glance the boys' relative ability. To complete the scheme, red cards might be used for assigning work to boys on individual projects. These cards may be used as a combination assignment or time card. A sample card is shown (Fig. 1).

In addition to the card system, a chart for each class should be devised. Some such chart as that shown (see Fig. 2) is suggested. This chart enables the teachers to assign the work more accurately. It is absolutely necessary in a continuation school to have each day's work carefully planned so that none of the precious two hours of shopwork will be wasted. It is also necessary to keep a careful record of each individual boy's progress.

To successfully plan shopwork an analysis of the projects to be undertaken is necessary. The chart printed (Fig. 3) illustrates the method of analyzing the job of making twenty kitchen tables.

The job analysis is the shop instructor's lesson plan. The shop instructor must first think thru his project, listing out every part to be made and every operation necessary on each part. The operations should next be grouped according to difficulty in the four grades. The operations are then written on the cards for assignment to the boys. By analyzing in this way the instructor can check up his teaching. The new operations will be the lessons necessary to be taught to the boys assigned to do them. If the instructor makes a careful analysis he will be sure to have work for all his pupils to do, the work will be ready at the right time for pupils of varying ability, and he will know in advance what stock and materials to provide for the project and will check up his stock on hand to make sure that the job can be completed.

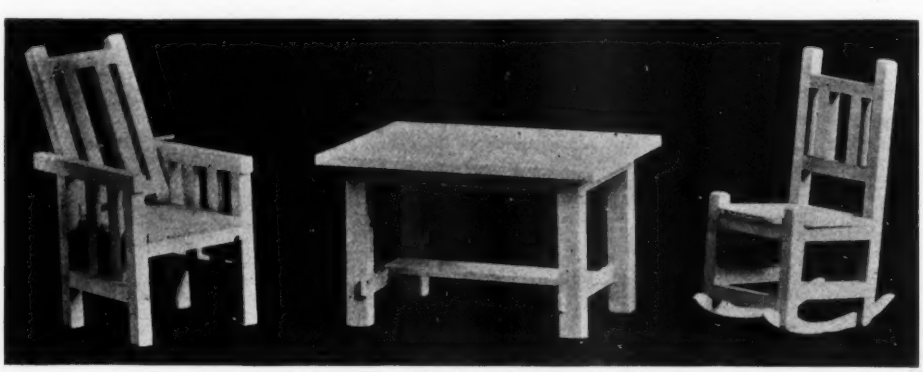
TEACHING FIFTH GRADE WOODWORK

II. DOLL FURNITURE

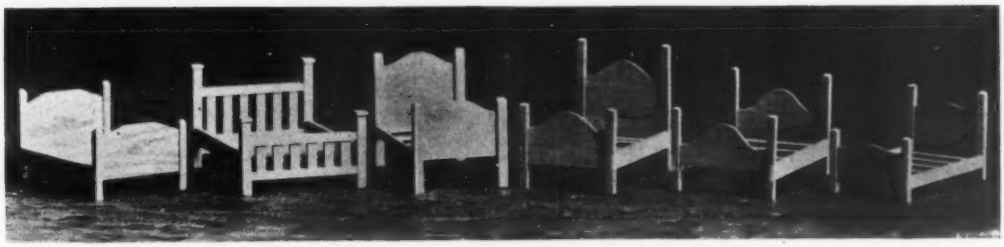
Fred L. Curran, Supervisor of Practice Teaching, Stout Institute, Menomonie, Wis.

THE fifth-grade boy needs a great deal of outdoor exercise and play and his mind is easily led by suggestions of outdoor activities. The windmill, the cart, the wagon and the wheelbarrow are problems which interest him from this viewpoint. To keep his mind developing rationally, his interests must be developed in many directions and the doll furniture projects offer some interesting possibilities.

As fifth-grade work, the doll furniture such as described in this article should not be begun until the last half of the year. By this time the boy should be able to



SOME FIFTH-GRADE DOLL FURNITURE.



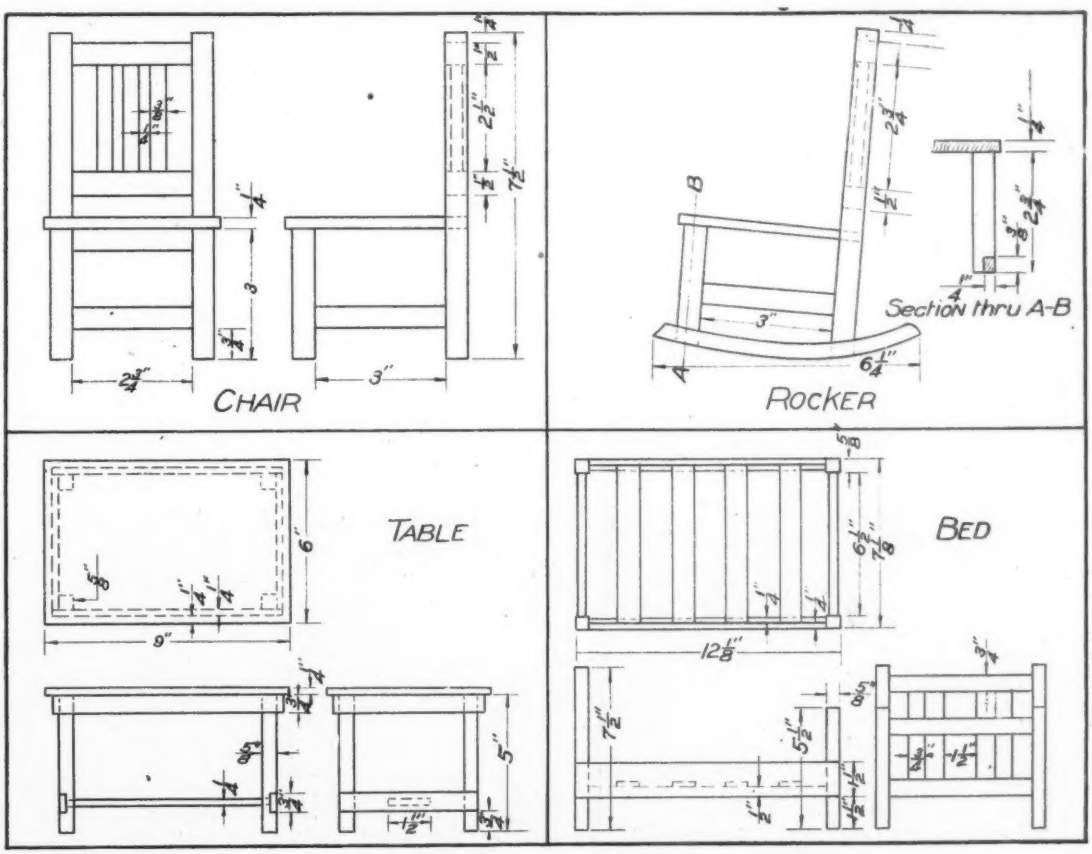
SOME VARIATIONS OF DESIGN FOR DOLL BED.

measure accurately to one-sixteenth of an inch, saw ends square and use the hammer well and carefully in nailing.

The four pieces shown in the drawings have been made for several years in the fifth grades and always prove interesting to the boys. They are designed with the thought that the chisel and plane will be used very little. The stock is reduced to thickness and width in the mill and the work left for the boy to do is largely measuring and laying out accurately; sawing carefully to line; and assembling. Here as in the windmill the teacher must demonstrate thoroly and often.

There are two important points to emphasize in teaching the lessons in doll furniture: First, the accurate measuring and cutting of the pieces to length and the sawing of the ends square; second, the nailing must be done carefully with long enough brads to make it strong.

In designing doll furniture most attention should be given to the proportion and general appearance. The types of joints used must be suitable both to the use of the finished projects and to the abilities of the boys who are to make them. Butt joints are used extensively and are quite strong and satisfactory when fastened together with long slim brads driven at an angle when possible. In fastening the side rails to the posts in the bed problem, it is necessary to notch the post and set the whole end of the rail in flush with the side of the post. This is a strong joint and one that the boys can make well. This joint is also used in the table where the lower end rails are fastened to the posts. Basswood is a good wood to use in these problems altho soft pine, butternut, whitewood, cypress and poplar are satisfactory.



DETAILS OF DOLL FURNITURE.

THE DOLL BEDS IN USE.

The projects when finished may be left in the natural wood or they may be painted white. The painting takes considerable time and is quite difficult work for the fifth-grade boys. If the classes are large it had better be omitted.

There are many pleasant associations that develop thru the making of doll furniture. The boys usually find opportunities to give it to their sisters or friends and if the right spirit prevails in the class, this making with their own hands and giving to some one who will enjoy it is highly beneficial in the life of every boy. The teacher should endeavor to promote the proper spirit by telling about the work of other classes, by asking questions of the class as to what might be a good thing to do with the doll furniture when finished, and by talking with individual boys in the class to find out what they would like to do with their pieces when they are finished. The success of this type of work will depend very largely upon the spirit of the class and their attitude toward the disposition of the finished work.

HOUSEHOLD MECHANICS

J. H. Trybom, Director of Industrial Education, Detroit, Mich.

DURING the past few years, many attempts have been made to enrich the courses in manual training. The theory that the greater the number of points of contact that can be established with various lines of industrial work, the better for the pupils, has gained many adherents. The "household mechanics" course is an attempt in this direction, with the possible added advantage of giving each student an opportunity to find out in what line his own ability and interests lie.

Household mechanics can serve as an elementary "try-out" course, as it involves a great variety of constructive exercises representing several of our common trade occupations. On the other hand, the old manual training idea—that a thing must be well done to accomplish the educational results that we are after—must not be sacrificed. At any rate, we as teachers should at all times be able to state that the completed exercise represents the pupil's best effort.

The immediate purpose of the course is—to give the boy a thoro knowledge of the use and maintenance of the various household appliances, involving various kinds of repairs, so as to secure efficient use of these appliances.

Household mechanics was introduced into the Detroit Public Schools manual training course, in the fall of 1917; six schools were equipped at that time. At this time there are 31 grade schools—three intermediate schools—and three high schools (6-year) equipped for this work.

This course is generally given to the students of the eighth grade; but in accordance with our new program for the intermediate schools, it will be given to all boys in the seventh grade.

The course is the result of the work of several committees of manual training teachers. The name of Mr. Earl L. Bedell should be especially mentioned in this connection, as he has had a great deal to do with the contents and organization of the course in its present form.

Contents of the Course.

1. **Building Materials.** Names of—and how to order—the materials commonly used in building. Writing a lumber order.
2. **Building Construction.** A study of the various parts of the building; and continuation of the study of materials.
3. **The City Building Code.** A study of the procedure necessary to get a permit to build a new building or remodel an old one. Study of the requirements of the code.
4. **Sharpening Tools.** Study of the methods and practices in sharpening bevel and wedge-edge tools, saws, and lawn mowers.

5. **Soldering.** A study of the principles of soldering; and practice in the use of the soldering iron, and in making some minor utensils.

6. **Glazing.** A study of the mixture of putty; and practice in its use.

7. **Nails and Screws.** A study of the correct use of nails and screws; applied on some special problems under construction.

8. **Paints and Varnishes.** Composition of good paint. Use of dryer. The principles of painting. Varnish removing. Refinishing of old furniture.

9. **Locks.** A study of different kinds of locks, and their mechanism; with practice in the setting of locks.

10. **Hinges.** A study of the sizes and kinds of hinges; and practice in setting hinges.

11. **Furniture Repair.** Study of fastening with glue, screws, angle irons, etc.; and practice in the repair of furniture.

12. **The Water Supply.** How the water is supplied; valves and their purposes; location of water pipes. Reading of water meter.

13. **The Range Boiler.** Circulation of warm water, illustrated by experiments. Connections and methods of heating.

14. **Faucets.** Types of faucets. Specifications, and repairs.

15. **Traps.** Kinds and purposes of traps. Ventilating; with actual practice in cleaning.

16. **Flush Tank.** Mechanical construction. Purpose. Study of minor repairs and adjustments.

17. **Electric Bells.** Electric door bell construction; current supplied by cells or transformers. Bell wiring problems.

18. **House Wiring.** Principal parts of house wiring system. Testing and replacing of fuses.

19. **Heating by Electricity.** General principles of electric heating. Electric heating elements in common use —as in flat irons, toasters, etc.

20. **Motors.** A study of a small motor, in use in carpet sweepers and washing machines with minor repairs.

21. **Fuel.** Different kinds of fuel. Cleaning of gas burners; and adjustment of air mixture.

22. **Hot-air Furnace.** Air circulation. Regulation of drafts. Cleaning of flues and grate.

23. **Steam-heating Plant.** A single-pipe steam-heating system; and principles of operation.

24. **Hot-water Heating Plant.** Circulation of hot water; and principles of operation.

25. **Refrigerator.** Principles of refrigeration. Non-conducting materials. Drainage. Economy of maintenance.

HOUSEHOLD MECHANICS.

Standard Equipment.

(Added to the regular Wood-shop Equipment.)

Builders' Hardware.

1 doz. pr. Butts, ball tipped pins, 3″ x 3″.
1 doz. pr. Butts, loose pin, 1¾″ x 1⅞″.
½ doz. Catches, cupboard, German bronze, Buhl & Son Cat. No. 05367.
1 Hasp, safety, 4½″, galvanized, wrought, Rayl. Fig. 1493.
½ doz. Hinges, wrought, ornamental, 3⅜″, corrugated (Butterfly), Rayl. No. 1416.
½ doz. Lock Sets, mortise, for inside door, japanned iron case, 3½″ x 3¼″, wrought steel front, one tumbler, reversible.
1 Padlock, 1½″, with 2 keys similar and equal in quality to Yale & Towne Intrepid No. 534J.
5 lbs. Tacks, cut No. 2.
5 lbs. Tacks, cut No. 4.
1 pr. Window Sash Locks, wrought steel, double inverted, Buhl & Son Cat. No. 1231.
1 pr. Window Sash Lifts, 1⅝″ x 4″, cast metal; Buhl Cat. No. 701864.
4 Window Frame Pulleys, front, 4$\frac{7}{16}$″ x 1″, diameter of wheel 2″, Buhl Cat. No. 42.
100 ft. Wire Cloth, 20″ wide, black.

Electrical Equipment.

4 Bells, iron box, 2½″, Menominee.
2 Buzzers, iron box, 2½″, Menominee.
2 Fuse Blocks, two circuit, 30 amp., 110 V., D. B. block, 2 wire.
1 Meter, recording watthour, A. C., 110 volt, 2 wire.
1 Motor, ¼ H. P., A. C., single phase, 110 volts, 60 cycle, for washing machine.
1 Motor, 1/6 H. P., Universal, single phase, 110 volts, for vacuum cleaner.
6 Plugs, attachment cords, Benjamin No. 903.
12 Push Buttons, wood, No. 1166.
1 doz. Receptacles, Fleat, trade No. 69001.
2 Sockets, chain pull.
2 Sockets, two plug (way), cluster No. 92.
6 Sockets, key, strain relief.
1 Soldering Iron, electric, American Beauty No. 3138.
1 Switch, lever, double pole, single throw, trade No. 128634 A.
4 Switches, two pole, wooden base, for 3 to 6 volts, about 1½ amp.
1 Transformer, bell ringing, Dongan Jr. P.

Electrical Supplies.

50 ft. Cord, electric light, C. C. No. 18.
6 Dry Cells, Columbia.
2 doz. Fuses, plug, 10 amp.
4 lbs. Staples, common ⅝″.
2 lbs. Staples, insulated.
6 1-lb. rolls Tape, friction.
1 1-lb. roll Tape, rubber.
2 1-lb. coils Wire, bell, No. 18, C. C.
200 ft. Wire, rubber insulated, No. 14.

Glaziers' Supplies.

1 lb. Glaziers' Points.
10 lbs. Putty (in sealed can).
10 lbs. Whiting.

Plumbing Equipment.

2 Basin Cocks, compression, ¼″, for iron pipe, porcelain indexed, nickel finish.
2 Bibb Cocks, compression, ½″, for iron pipe, T-handle, brass finish.
2 Bibb Cocks, compression hose, ½″, for iron pipe, T-handle, brass finish.
2 Bibb Cocks, Fuller, ½″, for iron pipe, porcelain indexed, nickel finish.
1 Cesspool Cover with bell trap, 6″ x 6″, iron strainer.
1 Faucet, bath tub combination, Fuller, porcelain indexed, nickel finish.
3 Floats, round, 5″.
1 Flushing Tank, low down, elevated supply valve, copper lined tank, float valve.
2 Sill Cocks, compression, ½″, for iron pipe, wheel handle, brass.
1 Sink, 18″ x 30″; cast iron, flat rim, enameled.
2 Traps, drum, cast iron, Park and McKay, page 430.
2 Traps, S, long S for sink collar, cast iron, Park and McKay.

Plumbing Supplies.

4 doz. Gaskets for compression faucets, ⅝″, composition rubber.
2 doz. Gaskets for Fuller faucets, ⅝″, composition rubber.

Tinners' Supplies.

2 lbs. Resin, in good sized lumps.
2 lbs. Salamoniac, large pieces.
3 ¼″ boxes Soldering Paste, "No Corrode."
5 lbs. Solder Wire, spool, 50-50.
5 sheets Tin, I. C., bright, 20″ x 28″.
2 lbs. Tinners' Rivets.
1 Wrench, Stillson, 6″ (pipe).
1 Wrench, Stillson, 8″ (pipe).

Tools and Appliances.

1 Fire Pot, one burner, ¼″ pipe connections, Johnson (Detroit Gas Co.).
6 Glass Cutters, multiple disc, Millers Falls.
2 Hammers, cross peen, 12 oz., Maydole.
2 prs. Pliers, cutting, flat nose, No. 50 Red Devils.
4 prs. Pliers, cutting, round nose, No. 645 Red Devils.
4 Putty Knives, Lamson.
6 Screw Drivers, 3″, Champion, regular.
2 prs. Snips, tinners', 2″ cut.
1 pr. Snips, tinners', curved 2″ cut.
2 prs. Soldering Coppers, 1½″, common.

Methods of Teaching.

These equipments have been installed in our regular manual training rooms in the elementary schools. As

the list shows, only a comparatively small equipment is allowed for each branch of work. The teacher has to organize his classes into groups of four to six pupils, each group being occupied with one particular line of work. This arrangement involves a good deal of organizing ability on the part of the teacher. His main effort should be directed towards keeping all the students of the class profitably employed. For this purpose, he will find it advisable to have a "student-foreman" in charge of each group; these students, having previously done this work, are familiar with the various exercises. They will receive excellent practice by this opportunity of assisting as teachers. We have found this arrangement works well in most classes.

Teachers' Training.

Manual training teachers cannot successfully undertake the instruction in this subject, without some special training. Altho the exercises may be familiar to a good many teachers, they would have some difficulty in undertaking this work without some special training in the methods of teaching and organization to be employed. Our teachers of household mechanics meet once every two weeks, in the evening, for a two-hour lesson, all the various constructive exercises are demonstrated and carried out in this course, and, besides, there is a good deal of emphasis placed on methods and organization.

It is evident that manual training has never been appreciated by parents in this city, to the same extent as at the present time, or since this course was introduced. Numerous reports from teachers and principals all agree on this point. On the other hand, if wholehearted purposeful activity is the cornerstone upon which education is built, the possibilities of household mechanics must be of considerable significance in this respect also, both in school and in the home. Such experiences as the successful repairing of a faucet, for instance, resulting in a saving in expense—and commendation from parents—must contribute to the growth of the child.

A PROJECT: THE MAKING OF A BOOK*

Helen M. Stockton, Supervisor of Fine and Industrial Arts and
Georgiana Johnson, Sixth Grade Teacher, Westfield, N. J.

The following outline was used in carrying out the project:

I. Conception of Project—to be gained by teacher from study of books and reference reading.
   - A. Text or content of book.
   - B. Type of printing.
   - C. Type of cover.
   - D. Type of binding.

II. Planning of the project.
   - A. Type of book to be made.
     1. Content.
     2. Type of print.
     3. Size of book.
     4. Method of binding.
     5. Method of printing.
     6. Illustration of text.
   - B. Materials necessary for the project.
     1. Kind.
     2. Size.
     3. Approximate cost.
   - C. Process involved.
     1. Printing.
        - a. Lettering.
        - b. Block printing.
        - c. Illuminated lettering.
     2. Paper making.
     3. Assembling.
     4. Covering—binding.

This project was the natural outgrowth of a series of lessons on lettering. The children had been studying lettering in their art classes and had become intensely interested in the different types of letters and the derivations of these types. Many of them had begun collecting examples of different styles of type from magazines and newspapers. These they had kept in boxes or envelopes, according to individual taste. All felt the need for a container of some sort, so it was decided that a scrapbook be made.

Types of scrapbooks were discussed and also the possible content of such a book. During the discussion, the idea of writing a book which would contain the necessary information about lettering developed. The idea of the scrapbook was dropped, and the children became enthusiastic in their desire to write, bind and own a book containing this desired information. They suggested numerous references and places where material relative to the subject might be obtained. The teacher supplemented this list and work on the project began in earnest.

Next followed a discussion of reference work done and selection and rejection of topics for the book. After much discussion, five topics were decided upon. The first, which was to be chapter one, was "The History of Writing"; the second, chapter two, "Origin and Early History of Paper Making"; third, "The Manufacture of Paper"; fourth, "The Invention of Printing"; and fifth, "The Printing Press." These five topics were later divided into subtopics. Each child then wrote a paragraph upon each of the subtopics. These paragraphs were then read to the class and the children decided upon those which were to go into the book. One paragraph on each subtopic was chosen and all then fitted together in order to complete the chapter. Care was taken that different children's work was represented.

The "Origin and Early History of Paper Making" was then taken up and treated in the same way as the first chapter. The writing was done in the period generally given over to English. The study of the modern manufacture of paper naturally followed the early history of paper-making and took the form of an Industrial Arts lesson, in which paper was actually made by the children. As the classroom was not very well adapt-

* This project was carried out in the sixth grade of the Lincoln School, Westfield, N. J.

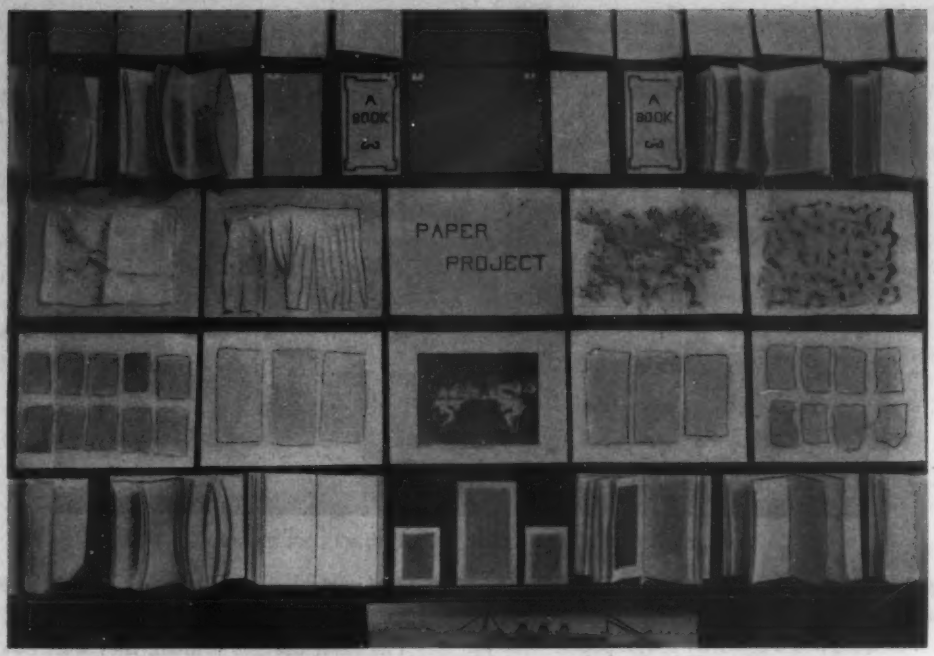


ILLUSTRATION 2. AN EXHIBIT OF MATERIALS USED IN THE BOOK MAKING PROJECT.

ed to a lesson of this kind, the class journeyed to the kindergarten room, where they could work in groups more easily and where the situation as a whole was less formal.

The children brought old linen rags from home, which they shredded (see illus. I and II). The teacher then boiled this shredded linen in caustic soda and rinsed it by placing in a sieve and running cold water thru it. This process was demonstrated by the teacher because the acid used was far too powerful to be placed in the hands of children. After the teacher had cleansed the fiber, she turned it over to the children and they added cold water and starch to the pulp. The next step was that of coloring. Five different colored dyes were on hand, and each pupil dyed his pulp according to his particular taste. This eventually resulted in a variety of attractive colored papers. The children then felted the fiber, using molds and deckles which the boys had made for that purpose in the manual training class. The fiber was then removed, placed between pieces of muslin and pressed between the rollers of an old clothes wringer which had been borrowed for that occasion.

Finally, the children sized the paper with gelatine, and dried it with a hot iron. These samples were later pasted into the book, under an appropriate heading. The lesson closed with a discussion of the value and extent of the paper-making industry.

The next topic was: "The Invention of Printing." This was dealt with in a socialized recitation in English. The children discussed the topic in class, went out and foraged around for information relative to the subject, and then came back to class and reported the results of their investigations. Topics and subtopics were chosen as in the first lesson and compositions written upon each subtopic. The compositions were duly criticised by the class and the best selected to go into the book.

This lesson was followed by a drawing lesson which dealt with the planning of a cover design. A suitable size and appropriate title were selected for the book, and a careful examination of numerous covers was made.

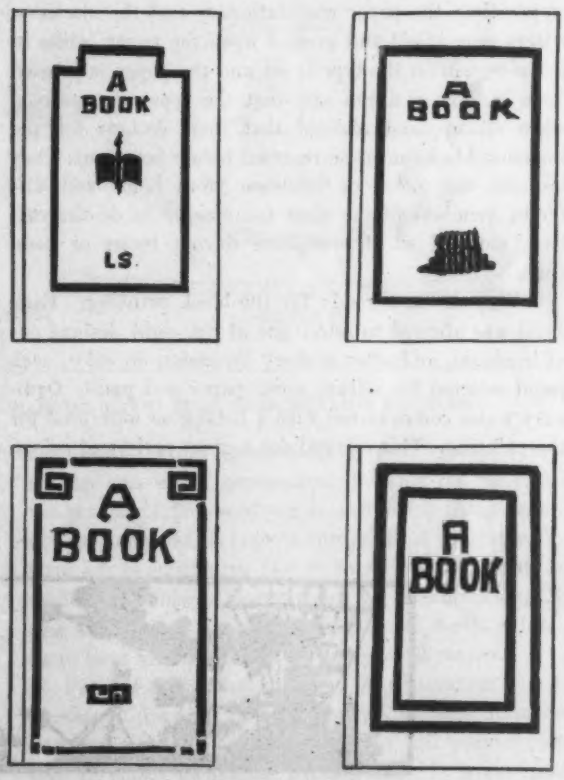


ILLUSTRATION 3. COVER DESIGNS BY THE PUPILS.

ILLUSTRATION 1. THE CLASS AT WORK, MAKING PAPER.

These were discussed at some length and the ideas of appropriateness, simplicity and balance were stressed. Each child then designed a cover on rough paper. These designs were duly submitted to the class for criticism and the best eight selected to be cut from linoleum (see Illus. III).

While the interest in printing was at its height, a visit to the printer's was decided upon. The class was taken to a nearby printer's, where a demonstration of the modern methods of printing was witnessed. Emphasis was placed upon the fact that in the old method of printing, the paper was stationary and the blocks or letters were inked and pressed upon the paper, while in the new method the type is set and the paper is pressed upon it. The children saw that the type was reversed when set up, and realized that their designs for the linoleum blocks must be reversed before being cut. They brought old pieces of linoleum from home and different members of the class volunteered to do the cutting, most of which was done during recess or noon time.

We were now ready for the block printing. Each child was allowed to select one of the eight designs cut of linoleum, and after a short discussion on color, each pupil selected his vellum, cover paper and paint. Ordinary water colors mixed with a little glue were used for the printing. This allowed for a great variety of colors. A pad of newspaper was placed under each cover paper, and the covers printed by the children.

The cover designs printed, they were now ready for the actual binding. The covers were made of strawboard hinged together with vellum and then the cover pasted in place. As no press was available, the children put the covers in their geographies and sat upon them. At the close of school the covers were carefully piled under a drawing board upon which bricks were placed.

In due time the proof of the text came back from the printers. The children were given exercises in proofreading and corrected the proof.

When the final copy was delivered, excitement ran high and they were indeed eager children who assembled the sections and sewed them together. These they then bound in the covers and pressed.

The final lesson was spent in drawing and illuminating initial letters which had purposely been omitted in the proof, the mounting of the photographs, and samples of the paper made, and the pasting in of appropriate illustrations.

Pictures of the class at work were taken and each child had one to mount in his book. On the last leaf of the book were autographs of the contributors—every member of the class.

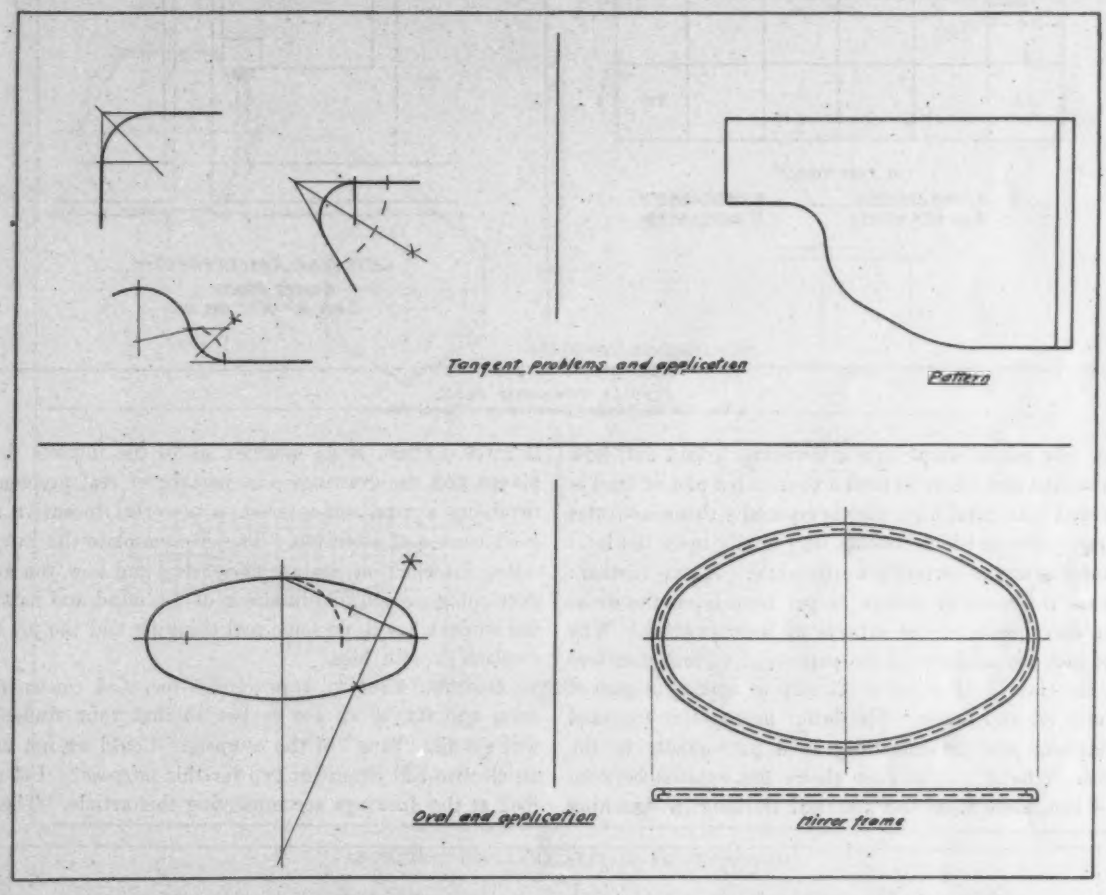
SOME PROBLEMS IN MECHANICAL DRAWING

Hans W. Schmidt, Madison, Wisconsin

ONE of the first things taken up in teaching mechanical drawing has to do with the proper use of the T square, triangles, scale, pencil, etc., and the orthodox procedure is to fill in numerous squares on the drawing paper with lines, straight, slant, criss-cross, at angles varying from 90 degrees to 15 degrees, curves, concentric circles, intricate geometrical designs and what not. All this in the fond belief that after all this has been accomplished the student will be able to delineate correctly, join his lines correctly, use compasses and not drag or back up on his pencil. As a disciplinary exercise method this might have value if all of the last stated results were accomplished. Unfortunately this is not often the case; observation in the field of supervision has satisfied the writer that the method falls far short of accomplishing what it set out to do. The first few lines are drawn with care—the rest are usually hurried along and but few sheets that the writer has seen show evidence of real progress.

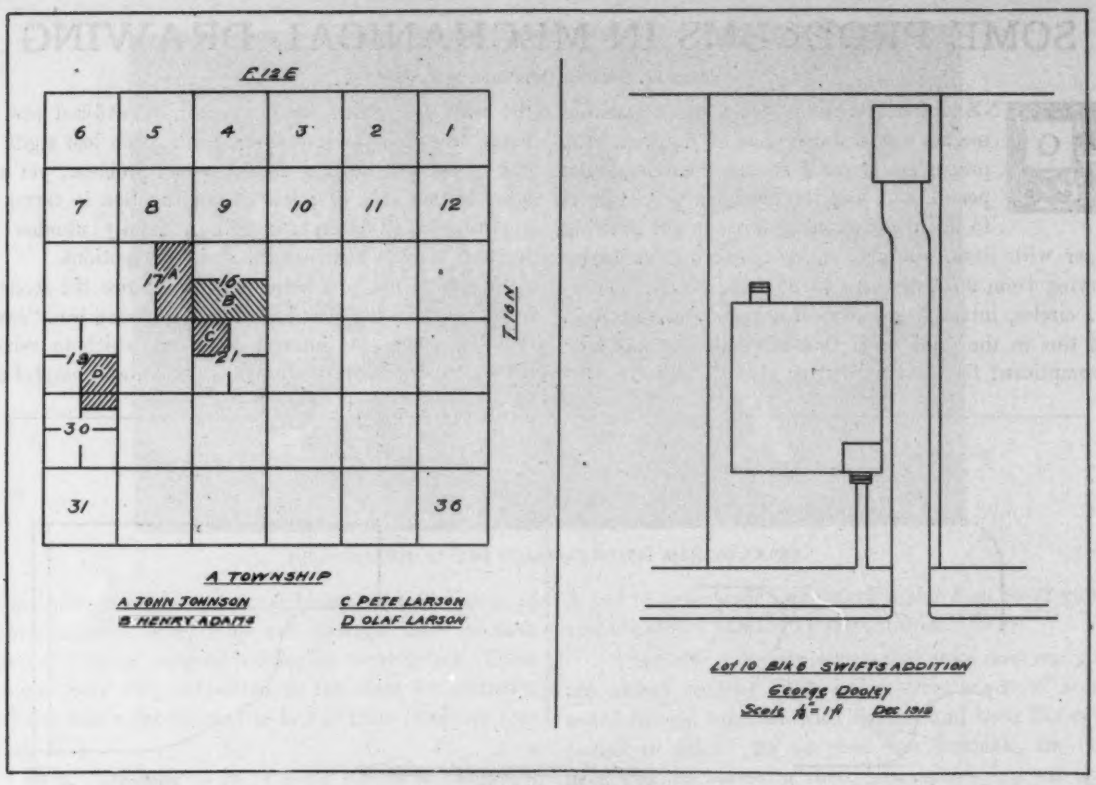
It would seem that a lack of interest in the problem is one of the contributory causes; another one is that the ends for which the problems are utilized are in many cases too far remote—a point often lost sight of and of decided bearing on the whole problem; yet another is that such exercises do not function in terms of applications. Conferences with a goodly number of teachers seem to bear out the above contentions.

Would it not be a better way to interest the student in his work in the very beginning by giving him "exercises" which are of interest, problems which he recognizes as worth while, work which necessitates careful attention and which incidentally gives a wealth of information and which necessitates thinking on the part of the students? It would not be a difficult thing to work out problems of this type of "projects" if you prefer that term—it is strictly au fait at present. The writer has made a number of suggestions to teachers along this line and it may be worth while to set forth a few of them here for the benefit of the general reader.



TYPICAL APPLICATIONS OF PRINCIPLES OF MECHANICAL DRAWING TO WOOD WORKING PROJECTS.

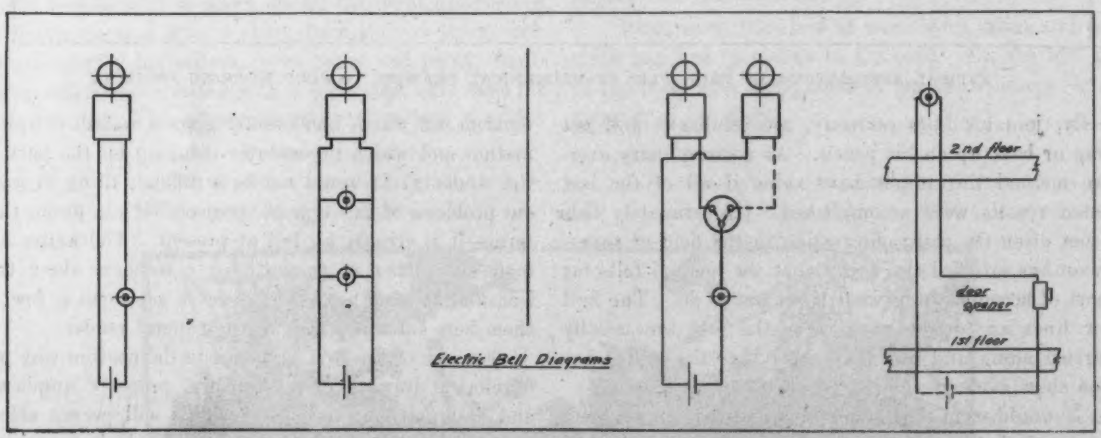
For one of the first problems in delineation why not develop a drawing of a township, properly numbered and designated by its locale? This will permit attention to pencil technique, scaling, etc. It is surprising



TYPICAL TOWNSHIP PLAT.
A Use for Mechanical Drawing in a Rural School.

how few people know how a township is laid out, how numbered and where in such a township a plot of land is located. In rural high schools especially this constitutes a real problem which touches very vitally upon the local situation and is certainly worth while. A step further: locate the town or village as per records on file or as per description in the articles of incorporation. Why not plot the holdings of the parents of various members of the class? It is not a far step to making a plat of a city lot and house. The latter necessitates freehand sketching and dimensioning as a prerequisite to the work in hand and at once shows the relation between the two, aside from the practical training in sketching it gives. There is no question as to the interest displayed and the drawings now partake of real problems involving a vital self-interest, a powerful incentive to good work and attention. They contemplate the interesting information you are dispensing and how you are developing proper coordinations of the mind and hand; the student has to do some real thinking and the joy of creation is with him.

But you want to draw circles too, and concentric ones, and maybe an arc or two so that your students will get the "hang" of the compass. Could we not use an electric bell circuit or two for this purpose? Let us look at the drawings accompanying this article. There

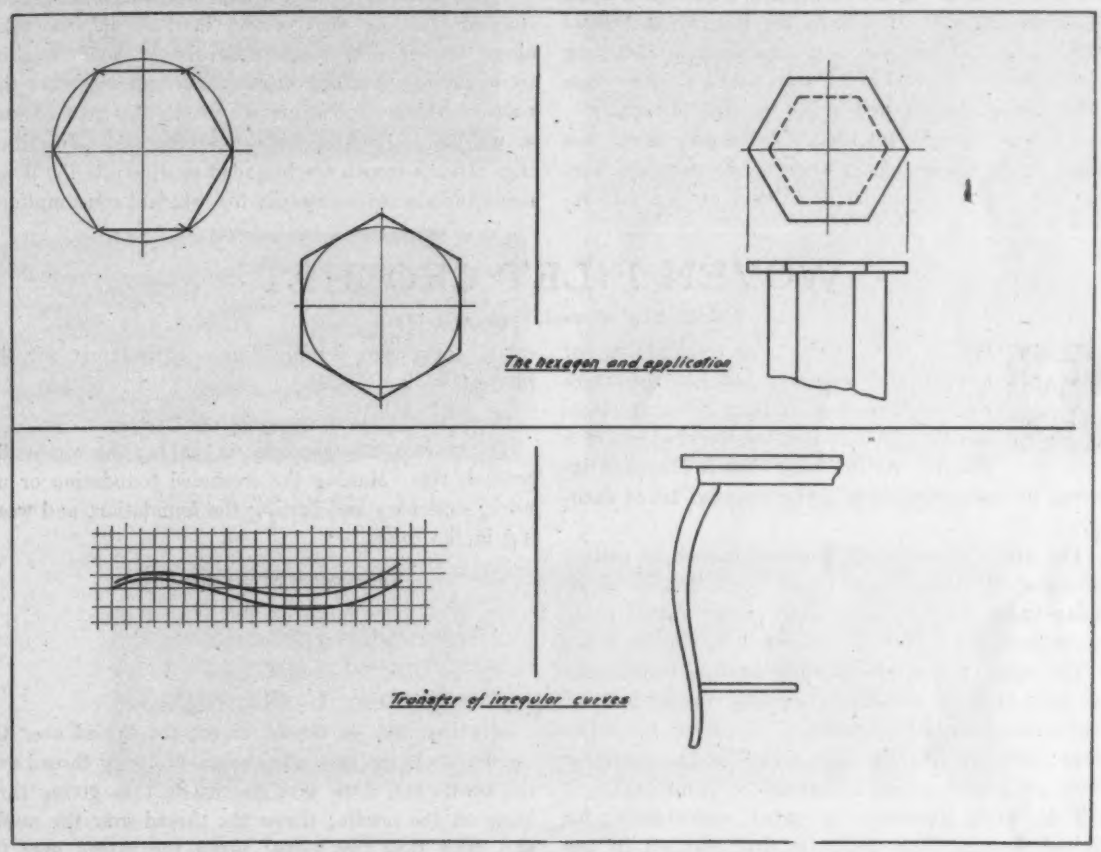


WIRING DIAGRAMS USED TO ILLUSTRATE CIRCLES AND STRAIGHT LINES.

are circles, concentric ones if you want them, straight line work, "junction" points, even broken lines. Can one wonder if the boys prefer this type of work to the exercise? It is all elementary work; plain delineation, single plane work, no projections, orthographic or isometric, no multiple view drawings; yet stimulating mentally, productive of real practice with instruments, and pencil besides representing good pedagogical procedure. The writer is quite sure if such work is pursued—it only needs a little planning and forethought—it ultimately also puts a teacher on his mettle to provide an interesting type of work when he comes to a more formal presentation of the work. And it is well that such is the case. We draw too many connecting rods, cams, and this and that, because the book says so or "it is in the course." The student does as he is told to do by the teacher, not often is he initiated into the reasons and purposes underlying much of the work nor is he given an insight into what the teacher is trying to accomplish. Would the boy react any differently if he were taken into the confidence of the teacher than if he were left in ignorance of the intents?

A short time ago the writer visited a class doing geometric constructions; there were four sheets with six problems on each, a total of 24 problems. A canvass of the students disclosed that less than half of them knew what geometric constructions were used for and but few could pick out one or two applications. Even the teacher found great difficulty in giving applications to mechanical drawing work for more than half of the problems being drawn. This is not an isolated case and it is feared that geometric problems are much *abused as means when no ends are in sight.* Retrospection on the part of teachers will likely disclose to them the truth of this.

A very little thought will show that a process of elimination among the usual problems is necessary and if one has to spend ten minutes in thinking up some application for any problem it had better be discarded, even "if it is in the course." It would seem an easy matter to clinch applications and follow a good procedure by presenting the geometrical construction and an application or two beside it. Students are not apt to mistake these constructions for exercises when the subject is presented as suggested. Try it on your drawing board.



GEOMETRIC PROBLEMS APPLIED TO FURNITURE.

While we are on the subject of drawing, how about exercises in lettering? Most students consider this part of their work drudgery and one cannot blame them much for this attitude when we see some of the methods used. Large sheets, eleven by fourteen inches, ruled with fifty or more lines and filled in with what is called

"lettering"—a most discouraging outlook and like woman's work, "never done." Why not substitute for the above small cards, say three by five inches, with four or five lines on them, to be filled out at the beginning of each period, until proficiency is being shown? Each card is complete in itself—it is a definite assignment; satisfaction, as a completed piece of work, goes with it. It permits the teacher to correct mistakes and apply remedial measures when the mistakes are still fresh in mind. The corrected cards are returned to the students daily. If the cards are arranged in chronological order they will show at a glance whether progress has been made or not. If the latter, it is a fine check upon the teacher as well. It checks the method and shows whether proper care has been exercised in detecting slovenly work. It works both ways and a student when confronted with his record has no recourse to excuses.

Another thought in this connection. Many, too many, drawings are spoiled by poor, slovenly lettering. Why not prohibit lettering or titleing until a fair degree of proficiency has been reached in the art? Placing the name, inconspicuously, on the back of the sheet will suffice for identification until the proper time for doing good lettering has arrived. This scheme will prove an added incentive for doing good lettering; the boy who has six or ten plates unlettered as compared with others having but one or two, soon begins to perk up—competition among boys is strongly developed and no youngster relishes having a "black" eye in the minds of his fellows even if his optics show no physical evidences of having been tampered with. The writer has seen this scheme work very well indeed.

In conclusion it may be said that much of our mechanical drawing work is too "mechanical," too much along set lines and often devoid of good teaching technique and teaching devices. Let us remember that rules of pedagogical procedure govern this type of work as well as in teaching history or English. The drawings given herewith are intended to illustrate the points made and are not necessarily for "student consumption."

WOVEN FILET CROCHET

S. E. E. Hammond, Springfield, Mass.

WOVEN filet crochet, a combination of crochet and weaving, has its advantages over filet crochet in that different colors can be introduced in the working out of a design. At the same time it furnishes intensive, interesting practice in the practical art of darning.

The kinds of materials are varied, such as cotton, linen, and silk threads and flosses; yarns; cords of all kinds; and even raffia—the determining factor being the use to which the lace is to be applied.

The applications are unlimited. Some suggested uses are: bands, medallions, inserts, and pockets for dress trimmings; medallions and bands for hat trimmings; laces for curtains; belts and bags; inserts for towels and linens, either as markers or trimmings.

This work furnishes a great opportunity for original design. The design is first planned in one tone on squared paper using either soft pencil or crayon. (See illus.) The spotting as to dark and light is next considered. Then, the color scheme having been decided upon, the design is worked out in crayons or water color. The open design is more satisfactory for this kind of work.

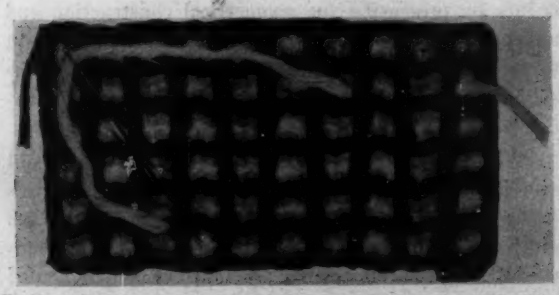


ILLUSTRATION 1. THE CROCHETED FOUNDATION.

Steps in Applying the Design.

Three steps are employed in making the woven filet crochet, viz: Making the crocheted foundation or net work, stretching and basting the foundation, and weaving in the colors.

Explanation of Crochet Terms.

Chain—(ch.)
Stitch—(st.)
Stitches—(sts.)
Double crochet—(d. c.)

Having loop on needle, throw the thread over the needle, insert the needle in the stitch, throw thread over the needle and draw thru the stitch, thus giving three loops on the needle; throw the thread over the needle and draw thru two loops; throw the thread over the needle and draw thru the two remaining loops, leaving one stitch on the needle.

Treble crochet (t c). Having loop on needle, throw the thread over the needle twice, insert the needle in the stitch; draw thread thru stitch; (there are now four loops on the needle); work off the loops by twos till one stitch remains on the needle. A space, a square, is formed by 2 d. c. with 1 st. between for fine net and 2 t. c. with 2 st., between for coarser net.

Crocheted Foundation.

The number of stitches in the foundation chain for the fine net is always determined by multiplying the number of squares in the width of the design by 2, adding 1 st., plus 4 sts. for the turn. For example, for a design 9 squares or spaces in width, multiply 2 times

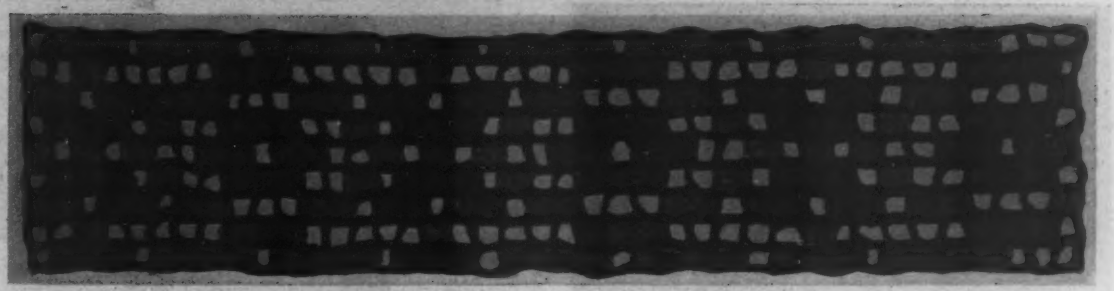


ILLUSTRATION 4

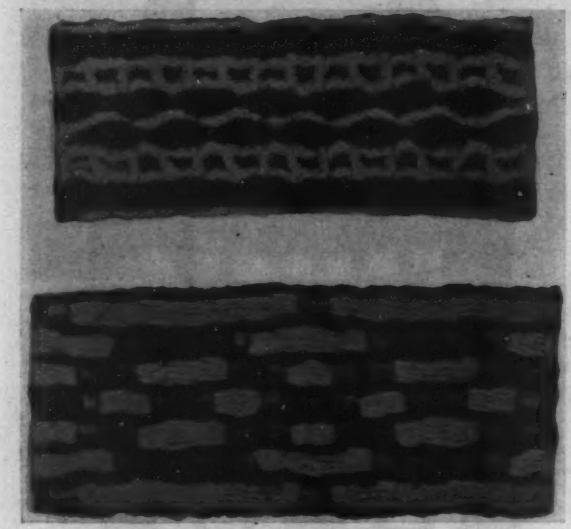


ILLUSTRATION 2 (Above).
ILLUSTRATION 3 (Below).

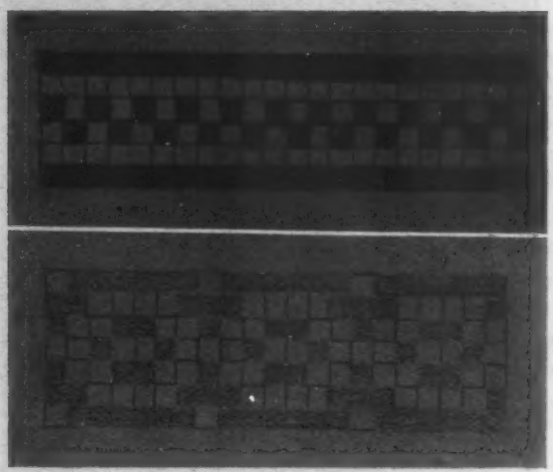


ILLUSTRATION 2A (Above).
ILLUSTRATION 3A (Below).

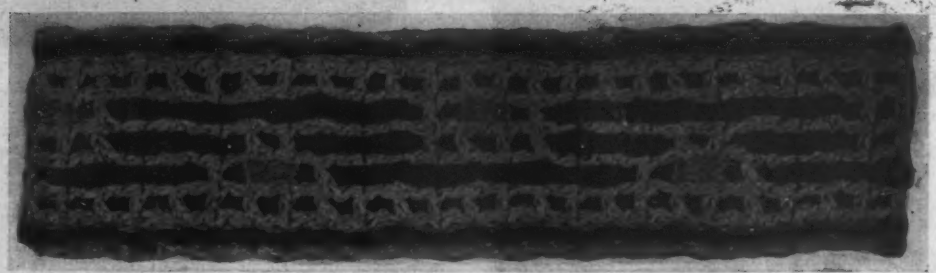


ILLUSTRATION 5

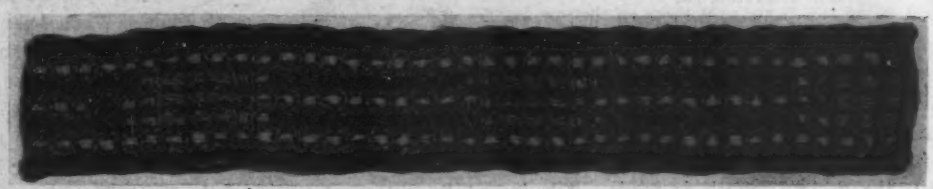


ILLUSTRATION 6

9, add 1, add 4 for turning, making in all a chain of 23 sts. The first space or square is made by joining the chain with a d. c. in the seventh stitch from the needle, the remaining spaces being made with 1 st. and 1 d. c. in the second chain stitch. Always take up two threads when inserting the needle in the previous row. A second row of squares is made by a chain of 4 to turn, joined with a d. c. in the top of the next d. c. of the previous row.

One should be very particular that these spaces are perfectly square as this is one of the important things required in the work.

For the coarser net the length of the foundation chain is determined by multiplying the number of squares in width by 3, plus 1 st., plus 5 sts., to turn. For example, a hat band 9 squares in width would require a chain 3 times 9, plus 1, plus 5 to turn, making in all 33 sts. The first square is made by joining with

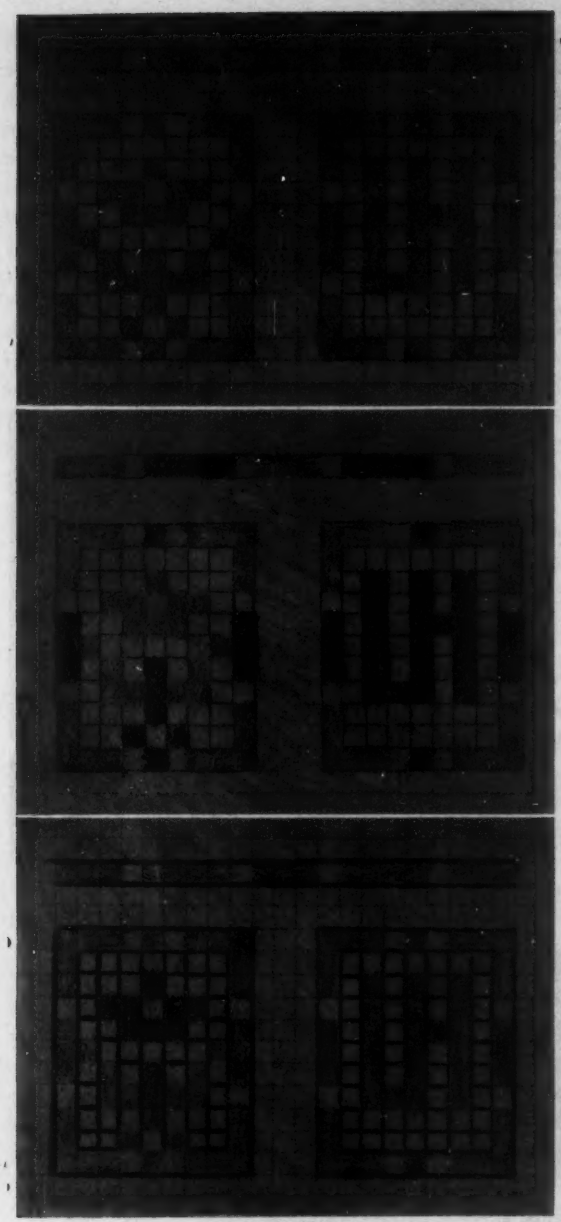


ILLUSTRATION 7A.
Left shows front of bag (Ill. 7) and right shows an alternate design.

the t. c. in the ninth stitch from the needle, the remaining squares being made with 2 ch. st. and 1 t. c. in each third chain stitch. A second row of squares is made with 5 ch. sts. to turn, joined with a t. c. in the top of the next t. c. of the previous row. Repeat the rows till the desired length is made. The loose crochet rather than the tight is the better adapted for this kind of work.

Stretching and Basting the Net Work.

From tag board, or light weight paste-board, cut a strip a little wider than the net and any desired length that will be easy to handle. Baste the *ends* and *edges* of the net or part of the net to this strip, being very careful to keep the width even and the spaces square. Use forty or fifty thread in basting so that the stitches will not interfere with the weaving. (Illus. 1.)

ILLUSTRATION 7.

The Weaving.

A long, slender darning needle will be found a good tool to use in this part of the work. Insert the needle-point between the net and board, one, two, or three squares back of where the spot of color is to be woven and push the needle thru the underside of the net to the square or squares to be filled in. (Illus. 1.) This is to hold the end of the weaving thread firmly and to do away with the use of knots. When weaving, insert the eye of the needle first, as this prevents splitting the threads of the net or of the woven color. Use the simple under-and-over weave when putting in the woven design. By a little careful planning, having many ends of the threads may be avoided by carrying the thread thru the under part of the net to the square or squares where another spot of the same tone or color is to be woven.

It is an important lesson to teach that the underside of the work should be as neat as the upper. Guard against pulling the thread too tightly in weaving. A loose and even tension is absolutely necessary in order that the lines of the netting may be kept straight. The woven spaces should be well filled so that the foundation color will not show thru. This will also bring out the woven design more clearly.

HANDWORK FOR INTERMEDIATE GRADES—I

C. Edward Newell, Director of Art and Handwork, Springfield, Mass.

The Airplane.

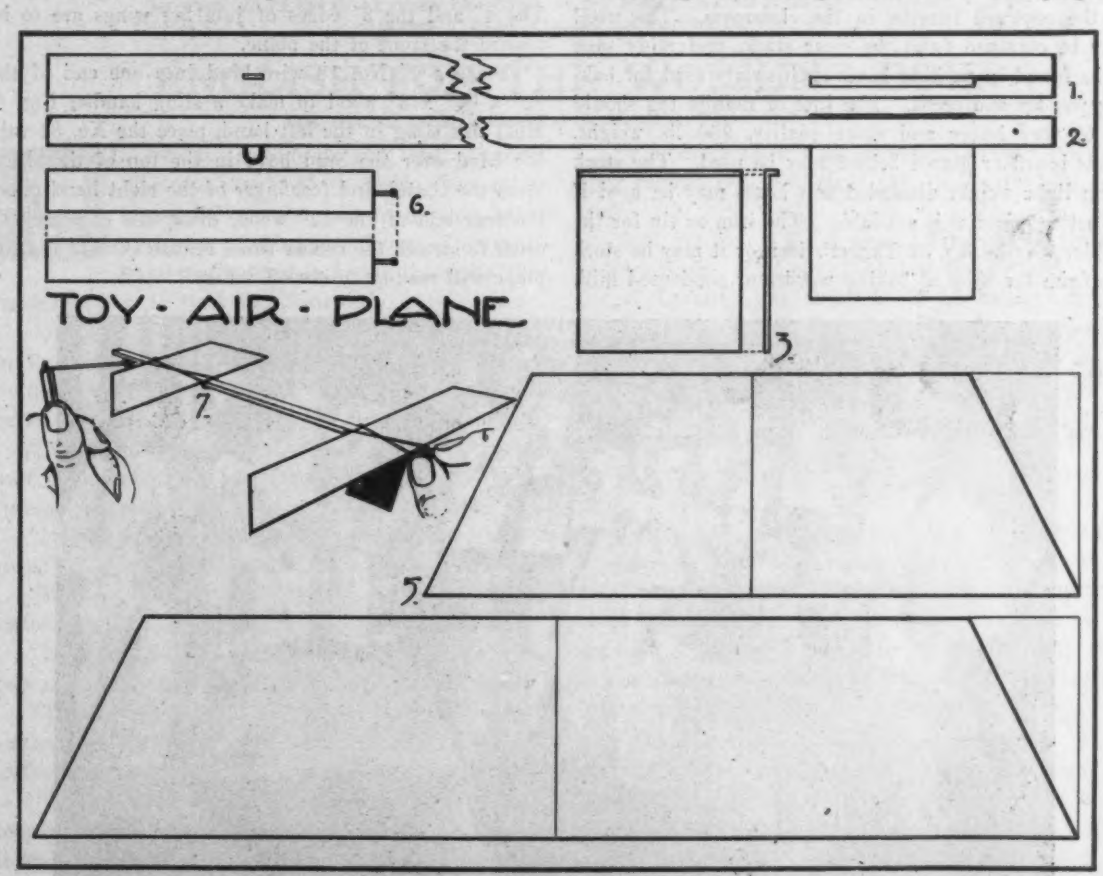
ARE not children vitally interested in transportation? Just ask them what they know about this subject from actual observation and you will be well entertained and possibly instructed by the lively recitals concerning the movement of trains, shifting of freights, passage of schooners, tugs and ferries. Most dramatic of all may be the stories about airplane maneuvers. How many boys and girls would prefer to make an airplane, one that will actually fly or will they prefer to make a "cord winder" a "window wedge" a "candle shade" assigned in some "prescribed" course of study? The vote will be an overwhelming majority, "a land slide" for the airplane.

Handwork for children of the present day must have a close association for their active not their passive interests. The projects must also possess a certain amount of the "play element." Discipline, accuracy in measures, good workmanship, pride in attainment never have to be commanded or demanded by instructors, neither do they have to be forced on the part of pupils when the aforesaid factors prevail.

A certain amount of dictation may have to be employed by instructors but this should be reduced to the least possible amount. We are sometimes justly criticised as being "too dictatorial" in our teaching. A real teacher will make a complete airplane, fly it across the playground or over the heads of the boys and girls in the room, then give the necessary instruction for the making and assembling of parts. By this method every boy and girl has a vision of the goal he or she will eventually reach. Rulers may be clattered with enthusiasm during construction but not with impatience. Points will be placed with very reasonable accuracy, not as the mere beginnings and endings for lines.

We hesitate to assign projects to any given grade or age since conditions vary so greatly in different localities, in public and private schools. The suggestions offered are for consideration by pupils below the sixth grade where shop or bench work is quite universally started.

The purposes and aims in these intermediate grades are to preserve the child's spontaneity and enthusiasm for drawing and building as a means of developing and



DETAILS OF TOY AIR PLANE.

expressing thought through form. Also as a means of developing judgment, sense of proportion, simple principles of balance, reasonable accuracy and skill in construction.

Since this period of a child's life is judgment forming rather than habit forming, it is quite essential that general education for all children should include some manual activities. Handwork provides an essential element in the education of the individual regardless of his future vocational interests. Accordingly this series of articles calls for the teaching of very simple basic principles of construction and the use of a few common tools. "We must discover the instincts, interests and capacities of pupils as they unfold in order that their art and handwork shall be of practical value and assert its educational value as a common means of expression."

The materials required for the construction of the toy airplane are as follows: one piece of soft wood ¼″ x ⅜″ x 12″; one piece of manila tag stock 2″ x 16″; one piece of thin iron or tin 1½″ x 1¾″; one wire blind staple ⅜″; one ⅜″ No. 20 wire nail; one rubber band No. 10; two rubber bands No. 32; one piece of soft wood ⅜″ x ⅜″ x 3″; one 1″ No. 18 wire brad.

The wood may be ordered from a mill or from a school shop in 3′ or 4′ lengths. These pieces can be cut to the required lengths in the classroom. The wood may be obtained from the clear stock, preferably pine to be found in packing boxes such as are used for baking powder and cocoa. The jute or manila tag should be of very heavy and stout quality, 250 lb. weight. Press board or glazed bristol may be used. The stock from light weight discarded suit boxes may be used if no better material is available. The iron or tin for the rudder may be No. 32 Tagger's iron or it may be stock cut from the sides of baking powder or condensed milk cans. The rubber bands must be of good quality, live rubber purchased by the ounce. Wire nails and brads are to be found at any hardware store.

In one end of the ¼″ x ⅜″ x 12″ wood cut a slit for the rudder 2¼″ deep, Fig. 1. Slide one 1½″ edge of thin iron or tin into slit in wood and bend the iron at right angles ⅛″ x 1½″, Figures 2 and 3. Slide rudder into slit as in Fig. 2 and drive one ⅜″ nail thru wood to close slit and hold rudder in place. Drive one ⅜″ wire blind staple into wood at point indicated in Figures 1 and 2, 2″ from end of wood. The blind staple should first be placed over a No. 32 rubber band. Measure and cut the 2″ x 16″ jute tag stock into two pieces; one 2″ x 10″, one 2″ x 6″. Measure and draw the short diameter of each piece. Measure and place two points each 1″ from the ends of the 10″ piece on one 10″ edge. Repeat the placing of points on one 6″ edge of 6″ piece. Draw lines from the points to the nearest opposite corners and cut on these four oblique lines, Figures 4 and 5. Place a No. 10 rubber band around the ¼″ x ⅜″ stick inside of the rudder, lay the 2″ x 8″ x 10″ jute tag on the wood, diameter over center opposite rudder, cross the band and slip the second end over the end of wood in which nail was driven. Repeat this exercise in order to fasten the 2″ x 4″ x 6″ jute tag to the opposite end of the stick just over the ⅜″ staple. The 4″ and the 8″ edges of jute tag wings are to be toward the front of the plane.

Drive a 1″ No. 18 wire brad into one end of the ⅜″ x ⅜″ x 3″ wood to make a sling handle, Fig. 6. Hold this sling in the left hand, place the No. 32 rubber band over the brad head in the top of the sling. With the thumb and forefinger of the right hand grasp the rear end of the 12″ wood, draw this end back in order to stretch the rubber band, release quickly and the plane will readily "make off," Fig. 7.

SOME DETROIT BIRDHOUSES AND THEIR MAKERS.
Class of Mr. Frank I. Solar, Instructor of Elementary Manual Training, Detroit, Mich.

AN EVENING CLASS IN PATTERN DRAFTING, SHEET METAL TRADES SCHOOL, CINCINNATI, O.
Chelsea L. Bailey, Principal and Co-ordinator.

ENGLISH FOR THE WORKING BOY

Mrs. Blanche Dunn, Principal of Continuation School, Erie, Pa.

ALL lessons should begin with what is known. The aim should be to develop and to increase information and to develop habits of correct thinking and doing. Induce the pupil to "talk shop." At the same time teach him how to "talk shop" correctly.

John Jones exhibits the foot stool he has just finished in the shopwork half of his continuation day. "Sam Smith is making one too, but he's going to turn out a better job. He aint..."

"What!!! Isn't Mr. Aint dead, and buried, and over there on the wall isn't there a tombstone with the epitaph 'Keep him down'?"

"How is Ignatius Chapowick getting along with his stool?" "His footstool is all done but the skin."

"What? O, no, Ignatius. It was skin, but it is leather now."

"Leather? Not much. It's an imitation made of paper. And Ig. paid for it."

"Then it wasn't a square deal to be sold imitation leather for the real thing! Did he pay for real leather?"

"Whose fault is it if you are deceived? You have to pay for your own ignorance. Don't let people 'put it over on you.'"

"How could you say that in English?"

"And how can you prevent deception?"

"You don't know what deception means? Get out your dictionary. Well, how can you prevent it. Get busy.

Well, get busy. Go to work. Find out all you can about leather. Find out about imitation leather. Find out if Ignatius was cheated. If he thought it was leather and paid the price for leather, he was cheated. If he paid the price of imitation leather and didn't know it, he was deceived because of his own ignorance. He ought to know better."

If books with required information are available, this is the psychological moment for some intense research work.

"What can you find? Make notes. Present facts."

Interest aroused? Try it.

And after the lesson is over the teacher feels as if he had been holding down a volcano.

Result—Ig. paid for imitation leather. He had cheated himself because he didn't want to pay for real leather and didn't know the difference.

Next time.....

How do you spell shellac? Queer word, isn't it. Rather queer origin too. If you knew all about it you would not misspell it. What does it look like? What does it do to the wood? It really puts a shell over the wood.

Tell the story.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN
Editors

EDITORIAL

CONTINUATION OR PART-TIME.

Some of the perplexities that are arising in connection with the newer phases of school work are due in considerable measure to a lack of uniformity in terminology. The term "continuation" as applied to certain schools and types of work has by virtue of tradition and association come to mean those schools and types of work which have later been designated as "part-time."

Thus under the Smith-Hughes law the work referred to as part-time work is the same work which for many years in Massachussetts and Wisconsin has been known as continuation work. But under the terminology commonly adopted in the state laws, especially in the west and middle-west, the term "continuation" has reference to a particular phase of the work carried on in a part-time school. This phase, or the "general continuation" work, is the same type of work that was earlier called "general improvement" courses.

Some have preferred to use the term "continuation" as the general term to include both the part-time and the evening school work. Since under the law the evening school work is trade extension in character, it would seem unnecessary to characterize it further. Since the part-time school recognizes three types of work, viz.: general continuation, trade extension, and trade preparatory, it would seem to us advisable to confine the use of the term "continuation" to the designation of that portion of the part-time school work which heretofore has been variously called "general continuation," "general improvement," etc. At least a common understanding should be arrived at so that discussions concerning the school work for employed minors may have a constant and accepted meaning to all.

SHOULD THE TEACHER PUNISH?

Our attention has been called recently to a repetition of the old issue between teachers and parents of a community with regard to the punishment of bad children in the schools. This is one of the questions that parent-teachers' associations are likely to discuss in any community, and there are conditions in the situation that seem to us not to have been sufficiently considered by the teacher.

Contrary to a persistent impression on the part of some parents and school authorities, teachers should not be expected to punish children for infractions of the rules. They are not trained nor employed for that purpose. The teacher is a leader and director of exercises to develop the character and mentality of children. The rules of conduct necessary to a school should be made clear by the teacher, but the administration of punishment is a responsibility which no thoughtful teacher will assume.

Citizens who take the law in their own hands are themselves breaking the law. The teacher who takes the law in his own hands is subject to discipline in most American communities. The citizen is not allowed to arm himself against the criminal, but must call upon the proper authority for redress. The best safeguard against crime, however, is certainty of immediate punishment. The school should be safeguarded against wilful infraction of rules by certainty of punishment.

We have seen capable teachers in the crowded schools of a large city confronted by pupils who defied the right of the teacher to "lay hands on them" because of a law against corporal punishment. The wise teacher will not assume police duties even under such provocation, but will make certain that authority is at hand to support him in the proper conduct of the school if he is to continue as a teacher in that school. No teacher with a proper conception of his profession will condescend to do police duty in connection with school instruction.

The athletic pedagog of the rural school, who reduced the bully of the community to submission, may have done a good job under adverse conditions, but he should be relieved of such a task under more civilized conditions.

There is but one reply to any zealous parent who makes dire threats against any teacher who lays hands on his progeny: "Have no fear that I will punish your child! I am not a policeman or jail-keeper, and if you need help of that sort, take your troubles to the principal, superintendent, or police."

Some of us recall the arm-pinching, ear-tweaking teacher who kept unruly members of the school under subjection. The recollection is not in favor of that teacher over others who kept us so busy and interested that we had no time or inclination for mischief.

No teacher who has done her duty thru the regular school period should be expected to keep the bad boy after school. This is perhaps an effective punishment for the boy, but the teacher who is obliged to remain after school hours with bad children should at least receive extra pay for extra service. The teacher should not be expected to punish children for any offense whatsoever.

WHERE THE MANUAL TRAINING TEACHER CAN HELP.

Frequently manual and industrial teachers express the regret that they are cut off from the work of the part-time school because of insufficient trade experience. There seems to be a rather widespread feeling that in order to have any connection with a part-time school the teacher must have had extensive trade experience.

It is generally true in the various states that teachers of shopwork are required to have considerable trade

training. However, there are other phases of the work that do not require trade experience. Teachers of non-vocational subjects, such as citizenship and hygiene, do not, of course, have to present qualifications in trade shopwork. Likewise, teachers of related English, mathematics, science, etc., are not held to the trade requirements, altho a sufficient contact with the trade and industrial world to make its terms and problems intelligible to them, is highly desirable.

Therefore, high grade manual and industrial arts teachers can render their best service to the part-time school in other capacities than that of shop teachers. Probably a very large percentage of the directors of part-time schools could not by any means qualify as teachers of shopwork, altho some contact with the trade and industrial world would be of great assistance to them.

The manual and industrial teachers should study the part-time school and the evening school problems and be ready to offer their assistance when the law takes full effect in the establishment of such schools. Teachers of these subjects are perhaps the best fitted, because of their experience and their point of view, of any teachers in the country to do the large share of the work which must be done in the name of the part-time and evening schools.

OBJECTIVES AND PUTTING THEM ACROSS.

A teacher who reads this magazine writes to us as follows: "A paper now and then on objectives in high school drawing would help me. I have had a wide experience as a practical mechanic and draftsman and have had a splendid technical training, but I find it difficult to pick out the essentials and put them across in a way that they will stick."

This is an interesting and significant request and we hope to be able to satisfy it. The statement is interesting and significant because it voices the state of mind of increasing numbers of teachers who are long on practical and technical training and short on pedagogical training and experience. This type of teacher is comparatively new in the schools but is increasing rapidly and promises to increase still more rapidly unless our facilities for training teachers can catch up with the demand for teachers. Standards on which objectives may be based have not been well established for instruction in the technical arts. Methods of putting objectives across are little better understood.

One conviction with regard to objectives in teaching is that the objective must represent the same definite purpose in the mind of the teacher and the pupil. Until the teacher and pupil agree upon a definite thing to be accomplished there is little hope of accomplishing much. One conclusion is reached with regard to methods of teaching. It is that the method must utilize in careful proportion, precept, example and practice according to the nature of the subject.

We hear from teachers of the trades in preparation for war that the average young man was taught a trade such as plumbing, bricklaying or rough carpentry in a few weeks by a little precept; good demonstration and persistent practice. The conditions under which this was done are not possible in the schools. The short periods of school instruction make it difficult to carry on a project that requires continued practice. With regard to instruction in drawing, the teacher is constantly baffled by the need of more time for the student to put on execution. Drill exercises in the use of instruments to give facility and accuracy have been reduced to a minimum or omitted entirely. Under the logical demand that a student should know what he is representing and at the same time gain facility and accuracy in the execution of the problem, courses in drawing have been formalized into a series of problems involving the objectives of both understanding and execution.

Perhaps the best method does not confuse these objectives in the same exercise. A finished, accurate drawing is the graphical statement of facts and conditions. Perhaps the method best adapted to school conditions is to consider drawing first as an aid in the study of a problem in geometry, mechanical construction or design; and finally as an exact statement of a problem that is understood.

This is the method employed in trade and professional work. The project is studied and formulated by sketches in pencil or some medium that may be changed readily. When the design is understood and verified, a careful, accurate drawing is made of it. To make the elaborate drawings of something that is not understood by the pupil may give some practice in the use of tools and mediums; but it will establish false pride and impressions and will not teach the essentials of drawing.

The method must accordingly vary with the objective. The objectives vary with the purpose of the course; if drawing in high school has a greater purpose than to give skill in handling instruments and mediums, then the objectives must include such an understanding of space relations, proportions, construction, composition, values, color, and so forth.

We have preached the doctrine of the hardship of work until we almost believe in it ourselves, and yet work gives to life all that there is to make life worth while. Work of itself has furnished to mankind more happiness than any other one thing. All work is not happiness, but life with no work would be unbearable. My idea of the real aristocrat, the man who can from within his own soul look down on others, is the master workman, no matter what his line of work may be. A job well done gives pleasure to the man who does it. There is happiness in the pride of being a master workman. There is happiness in the knowledge that one can work so well as to give a greater value in the work that is performed than is represented by the wage that is received.—*Henry L. Doherty.*

ART TEACHING AND THE ART INDUSTRIES*

Richard F. Bach, The Metropolitan Museum of Art

The story is told of a lady residing in one of our large cities that she chose a "one way" street on which to try out a new Ford; an officer noting her direction and speed stretched forth an arm of the law in a vain effort to stop the craft, shouting: "Don't you know this is a one way street?" From the car came a gasp but no reduction in speed and as the occupant struggled with suddenly stubborn controls the officer heard: "But I'm only going one way!" Had the feeling of the embryo chauffeur been consulted it might have been found that her sensations were, at that moment, those of going several ways at once.

The street of progress is a one way street. It may be said that in the industrial arts we are all going one way, but is it the same way, the right way, on the stately avenue toward better design? Like the victim of police regulations in our tale above, we are confused; not obtuse, not wilful, not selfish, not stupid—save the mark!—but surely unorganized. It remains for some wizard of crowd psychology—if a group of educators may be termed a crowd—to explode in our midst the bomb which will spur us all into activity, and activity of a productive kind.

We have trade schools, art schools, technical schools, vocational schools, industrial art schools, courses in applied design, in decorative design, in manual training, and a host of special schools dealing with these broader matters in relation to a single subject, such as costume design; and in addition practically all these things are being attacked here and there in our public schools, reached thru every manner of related teaching, such as applied science, geography, history, language, and—even instruction in drawing makes occasional contact with the principles of art!

All of these things are being done in so many ways that a graphic presentation of our united efforts would resemble the rapid readjustments on a kaleidoscope screen. And apart from the teaching method there is the curiously varied attitude of different schools, systems and individuals. Sometimes it is a slow grind with the objective of technical perfection; sometimes the impressionistic dash with the objective of *élan*, which is an excellent French word used by Americans to obscure poor execution by a smoke screen of unguided imagination. Rarely it is a resort to first principles, with a careful upbuilding of a structure that will be representative of us and yet be good. Again it is high seriousness—a sort of farce tragedy; or stolidity plodding too conservatively ever to stumble; or deftness that skims the surface touching only high spots and never sensing values.

No doubt there is need for all of these; for they are all human. Out of such variety as much uniformity as is really fundamental can with diligence and enthusiasm readily be constructed. They are all timely responses, and they unquestionably are all elements of the same chord. It is a matter of higher pedagogics to make them sound in harmony, to give them the same telling power and carrying quality (in spite of very poor acoustics) so that the objective of industrial usefulness may be achieved before the art industries finally decide that all the schools of art should be "scrapped."

To begin with let us make an odious comparison: fine art and industrial art. Do these words suggest comparison or contrast? Does their juxtaposition in the same line of type cause a revulsion in your mind?

Too often differences which are apparently the most outstanding, are those of degree only, not those represented in diametric opposites. So it is here. Fine arts and industrial arts are part of the same chain of reasoning; they require the same kind of thinking; they spring from the same roots; and what is more, those that we now call fine have always—until this sophisticated day—really been industrial. It is true that painters paint easel pictures that have no mural purpose, tho mural painting is the mother craft. It is also true that the painter uses no machines, tho his tools and pigments are made cheaper for him by the machine. But if the painter uses no machine it is only because the machine cannot do his thinking for him. On the other hand there are many other arts, metal, furniture, textiles, that do lend themselves in part to machine production without loss of artistic character. If the original design is good, the machine cannot hurt it. The use of poor materials or the abuse of the machine will not improve any design be it good or bad at the start; but here the industrial arts enjoy the same privilege as the arts called fine, for poor pigments will play havoc with the best subject.

The point, then, is that these classes of art, which are really of the same traditional stripe, lend themselves in differing degrees to the facilities of mechanical handling. When artists—and not teachers—lose sight of this fundamental unity of all the arts, they must perforce deny their own positions as designers.

What has encouraged this false attitude of looking down upon the industrial arts? It would be as wise a question to ask what has prompted us to look up to the fine arts. It is the machine, mass production. The machine has been the destroyer and at the same time the constructive genius of civilization. One invention after another has helped us gain speed or ease of production. And it was all so very easy that we forgot ourselves in contemplation of the splendid mechanism we had created. We expected it to do our bidding but never bade it aright. We fed it on the bread and water of design, and expected it to turn out the silks and lamps and tables and rings that would set by the ears the great styles for which Ghiberti, Cellini, Gouthiere and Boulle were the spokesmen.

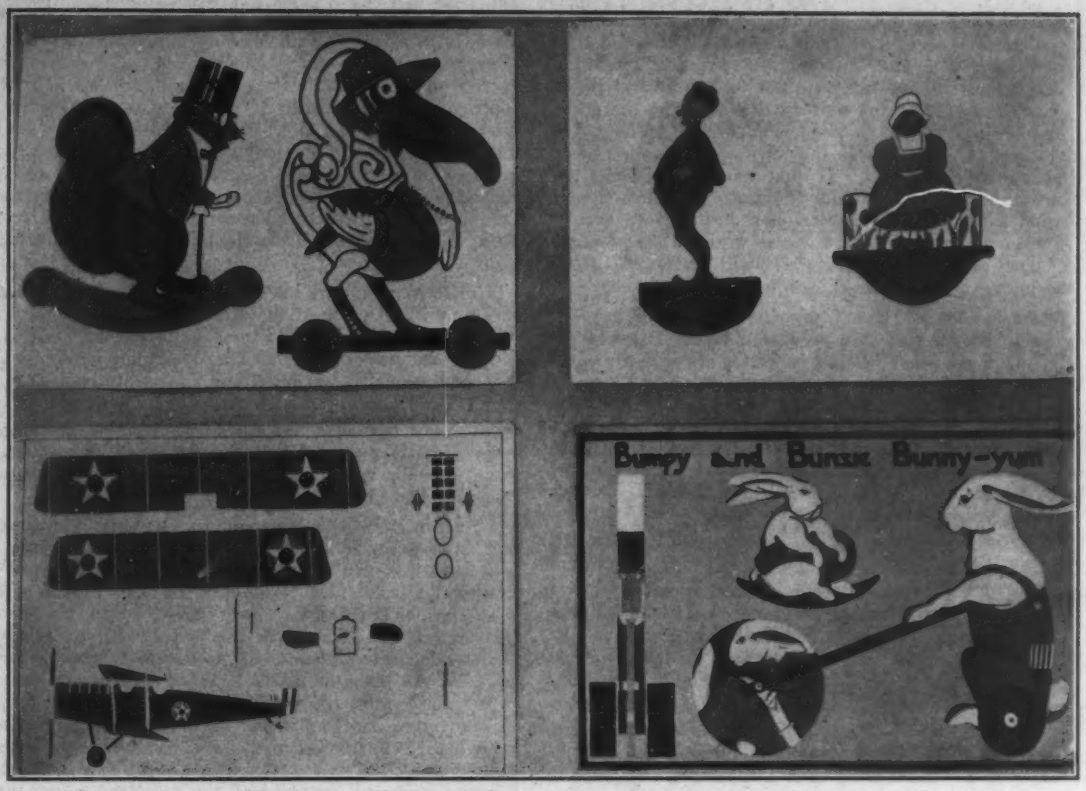
At the same time the call of the dollar, quickly made on the principle of rapid production and even more rapid distribution, also sounded loud and clear in the ears of American business men. The machine was the commercial agent and helpmeet and, being duly commanded, it did the work as directed. So we got designs quickly with more haste in cash return and less speed in progress of design. But the fault is ours, not the machine's.

To get a proper light on the whole matter of the machine we need only to follow thru from conception to completion any good piece of work in which complicated machinery plays a part. Such an inspection will promptly dispel any false notions as to the craftsmanship of present day work. The machine will stay and the craftsman of old also will stay (may his tribe increase); they will simply be doing two different things. And only one of these things will most of us be able to possess.

In any case, objects of industrial art are not bad because the machine had to do with their making; any more than objects of pure craftsmanship are good because the machine had nothing to do with their making.

You have all used a screw driver, and probably most of you have resorted to wearisome torsion of the wrist to make it do its work. Some of you may have seen a carpenter use a screw driver and wondered at his tool: he got his results by pressure and a ratchet device in the handle translated his pressure into the torsion that an ordinary screwdriver requires. Consequence: the man can drive six or eight screws in the time one demanded before. Was the improvement worth while? Could a craftsman legitimately use such a tool, granted that a craftsman may use machine-made metal screws at all? Yet this device has only a remote control over the design and does a kind of work that other tools and other things besides

*An address delivered at the Convention of the New York State Teachers' Association and affiliated organizations, held at Rochester, N. Y., Nov. 23, 1920.



SOME TOY DESIGNS MADE IN THE NEW YORK CITY HIGH SCHOOL CLASSES.
Courtesy Dr. James P. Haney.

screws could accomplish as well. But further: in large woodworking factories, the original torsion movement is operated by power, transmitted from a dynamo thru other mechanical contrivances to a flexible shaft at the end of which the screwdriver is fastened as a bit is fastened into a brace. Now the time of one screw is distributed, by help of a high mechanical development and the use of electricity, over scores of screws. Each such step reduces the time of labor, but makes no difference in the quality of either material or execution. Again it is a proper question: is the improvement worth while? Each such improvement brings the resultant piece of work within reach of a larger number of consumers. Thus we approximate the fundamental requirements of democratic living.

And the same sequence of steps could be shown in the lathe, the loom, the potter's wheel, the various power driven devices used in making silverware and jewelry. It is not the machine that destroys design. To blame it on the machine is to confess inability properly to use the machine. A mechanism cannot be reasoned with; it must be controlled ruthlessly. A mercerized cotton warp and a wood pulp filling will not produce in the journey thru the loom a pure silk fabric. A mediocre conception on paper combined with poor equipment inadequately understood will not produce a masterpiece in metal or in millinery. The answer is: workman, know thy tools.

So the primary requirement to bring art teaching to bear upon industrial demands is to know the tools of the trade we wish to reach. Imagination as an abstract quality of mind is a drug on the market; imagination as applied to a purpose, as an agency for conquering adverse conditions surrounding production, is the salvation of art of all kinds. Instead of courses in "applied design," we might think of them as courses in "applied imagination!" In the words "decorative arts," the first is an adjective, it qualifies. Yet most of the designs made in the schools, and the majority of those made by alleged professional designers, suggest—and indeed insist—that decoration, like imagination, can exist independently. If such were the case the theories of Einstein would be past history to the ordinary child of five, and mediums would need to discover new ethers in which to suspend their spirits.

On the other side we have, however, the spark which starts the whole conflagration, namely the genius of design, the ability to take infinite pains, and with it the knowledge of style, the control over the materials of drawing. Knowledge of the mechanical requirements of production will not make design; the experience of the last century has shown that all too well. Ability to design on paper is worth even less, for it will not give us even plain materials without decoration at all. Both must be the equipment of the designer, and in a sense—so far as trained discrimination goes—both should be the equipment of the producer himself.

We have laid design aside while as a nation we devoted ourselves to the machine. It is a new experience for humanity to conquer so many contrivances of quick production in so short a space of years. It is not remarkable that we have "fumbled" one line while trying our hands at another. But now that the machine is firmly fixed as a factor in our lives, let us use it to help assure production of always better designs.

Remedies are always of two kinds: immediate, to stop the bleeding as it were, and ultimate, to bring about the healing or cure. Thus we can attack our problem from two directions: as a prompt corrective we can teach the younger generation of designers those things which will make them understand the implements of production, and their work should be better for the added handicap else they will never be designers; as a final tonic we can reach the larger mass by teaching judgment, discrimination, appreciation to all. Thus we shall have a higher level for the mass, and the prospective designer has a better beginning, tho his path to glory will not be shorter for that.

A general opinion in favor of such a procedure means many things. It means that we must all be much wiser than we are at this minute. It means that we must all

keep on studying until we have taught our last class, and work harder for each class than we did for the one that preceded it. It means that aimless drawing must go, drawing which means only conquest of pencil and paper and ends there. It means that all drawing, tho the pupil may be planning to be a policeman, must have an objective of some kind, an objective in the form of application or of production in the round. If that cannot be done, the victim will be happier without drawing or perhaps should be turned loose in the carpenter shop or foundry. Drawing is not as fundamental a thing as we here are prone to think; most people have always and will always eat, sleep and be merry without knowing anything about it.

But more, we will have need of a new kind of teacher, a kind that does not exist now, a teacher of art appreciation. I mean a teacher who never writes art with a capital letter or comes to an art museum only to pray. I mean a teacher that can make this great language of all peoples intelligible to John Doe and Mrs. Brown and if necessary to every Tom Sawyer and Huck Finn in the land. That would be indeed a teacher (and special legislation at Albany would undoubtedly bring her a third of one per cent increase in salary).

The aim of it all is, briefly, to reach those who will design for production and those who will be the ultimate consumers of the objects produced. Yes, we shall always have dealers and distributors. They also must be trained. They also are going to be trained, and the process will be painful, for the public will not buy poor design,—I refer to the kind of public our scheme will produce. But there are signs of awakening among these dealers, who manufacture nothing but profit and are but middle men that handle art as they handle potatoes. There is no room to indicate here the manner of their awakening, but there is promise and hope for the future.

So we have the need for good design, and the adaptability of this to machine production; and we have the greater general knowledge among the public regarding art as a cultural investment. We could go on indefinitely and speak of the relation of good design in home environment to citizenship, home furnishings as a background for growing youth. It all comes to one thing: being alive to current issues. Art instructors—and legislators—and superintendents, I might add—have not been alive to current issues or else they would have seen in this mechanical development some clue for improvement of their own work.

What can be done, tho not in a school, may be seen at The Metropolitan Museum of Art. Here a department is maintained for the express use of manufacturers and designers, for many of whom it is second nature to draw inspiration from the collections. We have in New York an art museum that has gone into trade. Practically, that is what The Metropolitan Museum has done. No amount of arching of eyebrows in select circles will avail; for as we live by trade, it behooves the museum to help trade improve the commodities it brings to us all. Manufacturers and designers now use the collections as sources of inspiration in their current designs; men's cravats inspired from armor, a lighting fixture from a Greek mirror, a lamp from a Sheraton chair, a mirror from a French ormolu furniture decoration, a talcum can from a Chinese vase, a gown from a painting, a soap wrapper from a snuff box.

That so many trades find their desired motives thus variously in all parts of the Museum shows that they consider the galleries but additions to their own facilities, a hopeful augury of progress for American home furnishings and industrial arts generally.

A staff officer of the Museum devotes his time to these many trades, about forty of them, reaching many firms directly and many more thru their representative trade journals which have manfully gone to work in the cause of American design.

Still further the Metropolitan Museum gains attention from salespeople and "buyers," engaged in shops and department stores. These attend the Study Hours for Practical Workers, the purpose of which is to add to their qualifications that sales idea which we in our distant manner call art. Design is a splendid "selling argument" if the salesperson knows how to place it properly in his brief for the piece he wants you to buy. In the presence of standard museum pieces, the merits and defects of objects out of current stock in the stores are discussed. First hand information results and the number of satisfied customers in the stores increases accordingly; as witness I quote only one example of the salesman whose newly gained knowledge of color combinations doubled his sales of feather fans.

All these are but practical suggestions from an allied educational institution but one withal that has seen the line of progress and has kept a steady course toward better design for American homes.

How much greater efforts can the school put forth; the general schools toward general appreciation of art as a cultural background, and the special schools as training centres for practical useful designers who know their tools, however complicated the course of production.

The trail toward progress is plainly blazed; there is but one way to go.

NOTE: Information as to the various types of educational and extension work maintained by The Metropolitan Museum of Art may be had by addressing Mr. Henry W. Kent, Secretary, The Metropolitan Museum, Fifth Avenue and 82nd Street, New York City.

A FORMIDABLE SHOWING OF BIRDHOUSES.
The results of the 1921 drive for birdhouses in one district school, the Essex Street Public School, Toronto, Canada.
A. J. Rostance, Esq., Instructor of Manual Training.

PROBLEMS AND PROJECTS

The Department of Problems and Projects aims to present each month a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, patternmaking, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

Drawings and manuscripts should be addressed: The Editors, INDUSTRIAL-ARTS MAGAZINE, Milwaukee, Wis.

SOME ELEMENTARY ELECTRICAL MODELS.

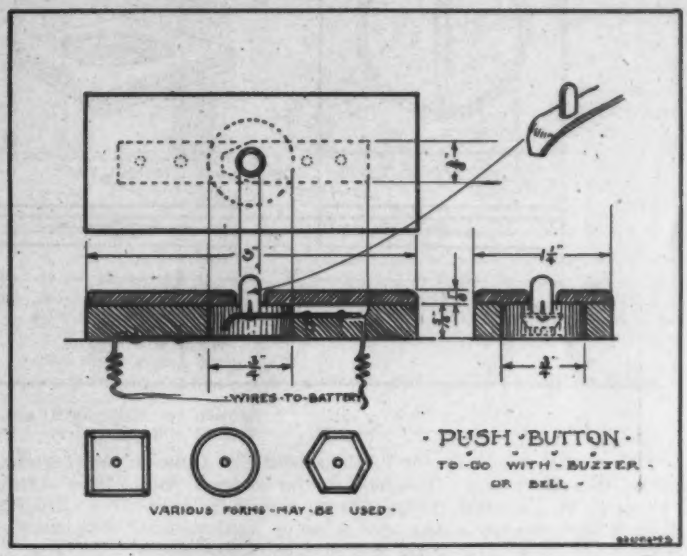
F. C. Hughes, Spokane, Wash.

The projects shown and described in this article combine work in both wood and metal and offer to the sixth and seventh grade boys some elementary electrical experiments that may be included in a series with other projects such as the motor shown in the May, 1920 number of the INDUSTRIAL-ARTS MAGAZINE and others.

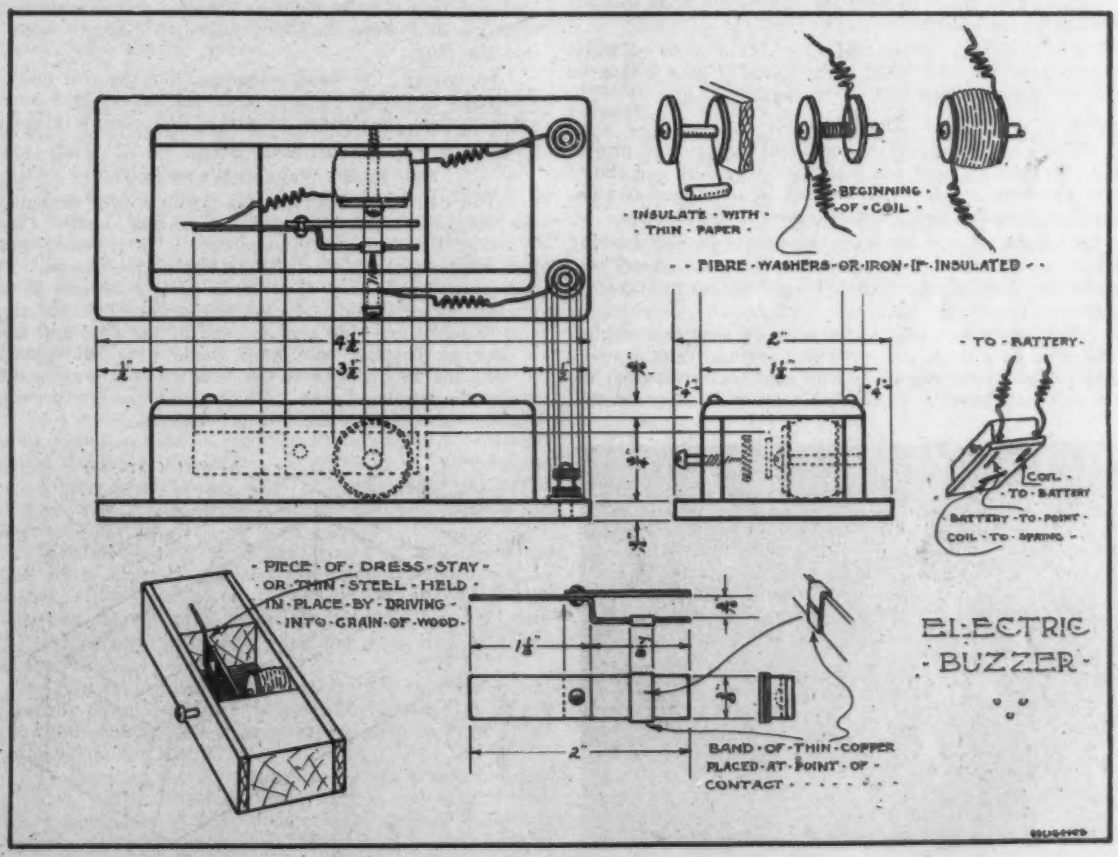
The Compass.

The compass in any form probably offers the simplest of all electrical experiments, giving to the boys as it does the principles of the magnet and the difference between the poles.

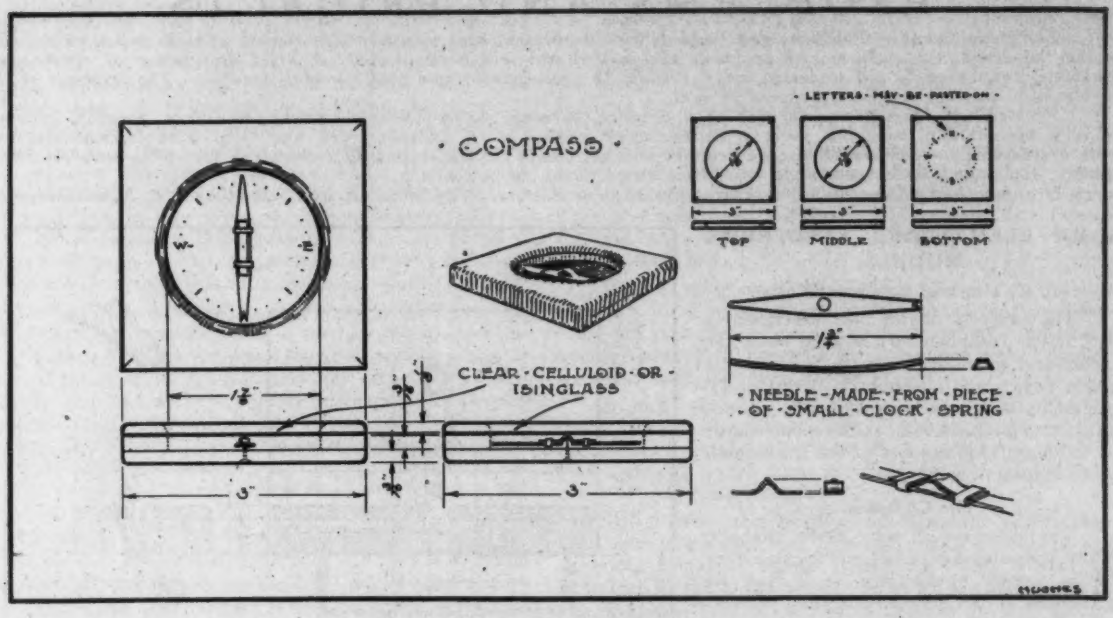
The body of this compass is made of three thin pieces of wood as shown in the drawing. Between the two top pieces is placed a piece of thin transparent celluloid which may be bought in large sheets and cut to size.



DETAIL OF PUSH BUTTON.


INSULATE WITH THIN PAPER
BEGINNING OF COIL
FIBRE WASHERS OR IRON IF INSULATED
TO BATTERY
COIL TO BATTERY
BATTERY TO POINT
COIL TO SPRING
PIECE OF DRESS STAY OR THIN STEEL HELD IN PLACE BY DRIVING INTO GRAIN OF WOOD
BAND OF THIN COPPER PLACED AT POINT OF CONTACT
ELECTRIC BUZZER

DETAIL OF BUZZER.



DETAIL OF BOYS' COMPASS.

The needle should be cut to shape and size from a piece of thin hard steel. The hole in the center should be about $\frac{1}{8}$" in diameter. Magnetize the needle by drawing from end to end, across the poles of a horse-shoe magnet or those of an electric coil, and hang the needle as shown in the drawing, using thin metal for the hanger.

Hard steel must be used for this needle or it will not retain its magnetism.

The dial may be painted white, or a piece of white paper pasted on the wood. The outside may either be painted black or stained.

The Buzzer.

The electric bell or buzzer is a very simple project and one that all boys are interested in. The one shown here has been tried out in several large classes and has proven successful and practical in each case.

The coil should be made as shown in the drawing using a round head, iron screw for the core. Wind with about ten feet of about No. 18 cotton covered magnet wire.

The vibrator is made of a piece of very thin flexible steel such as a dress stay or watch spring. The drawing shows how this spring should be bent and riveted to the piece of soft iron. A band of thin brass or copper should be placed about the spring to keep the point of contact from burning a hole thru it.

Binding posts may be those taken from discarded dry cell batteries.

Push Button.

Along with the bell or buzzer should be the push button. This may be made as shown in the drawing but the form and shape may be changed in different ways to suit the pupil.

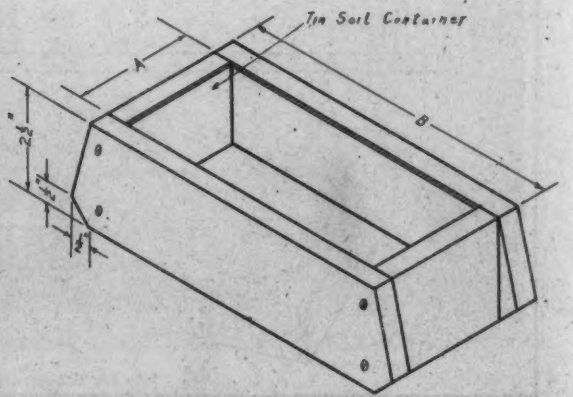
In wiring, the small wire used for the coil may be also used and connected up with the battery and buzzer so that when the button is pushed the circuit is closed.

PLANT BOX.

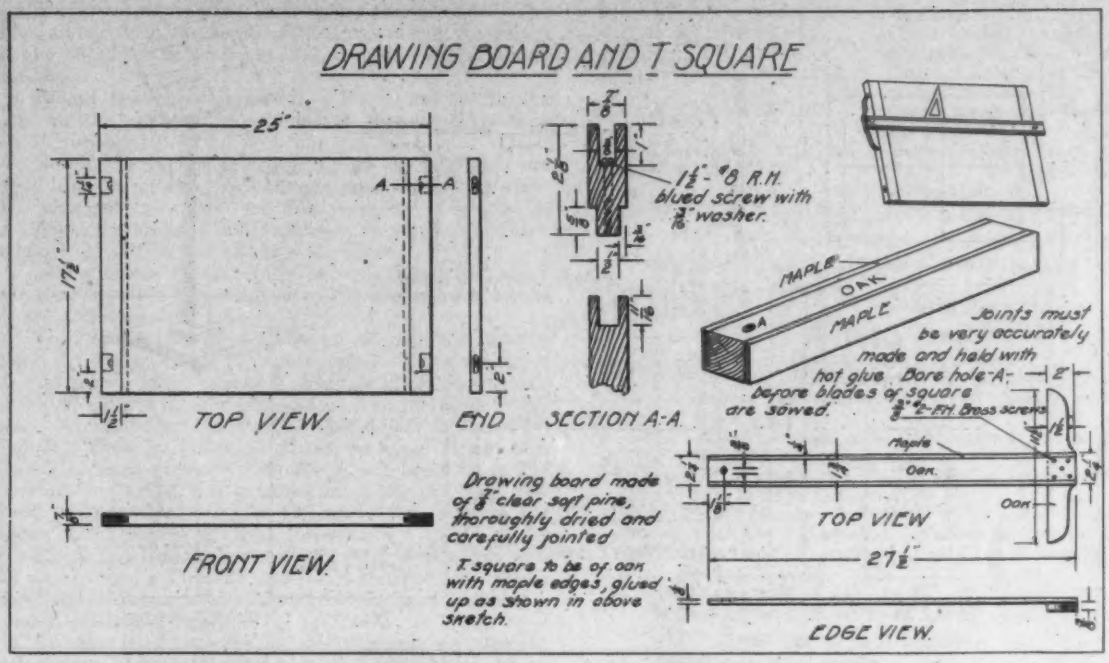
R. W. Wagner, Webb, Ia.

The utilizing of scraps is a problem ever present in the school shops. In making reading lamps (from Worst's "Problems in Woodwork") a large waste piece was cut from the center of each side of the shades. The accompanying figures illustrate a project devised to use up this scrap. The V shaped pieces were just the right size to make one side and one end of the box, and since it has no bottom, one lamp shade provided material enough for two boxes. A tin box, for soil, was secured inside the wooden frame. Making this tin box provided a simple exercise in sheet metal work.

PLANT BOX.



DETAIL OF PLANT BOX TO BE MADE OF SCRAPS.


DRAWING BOARD AND T SQUARE
25"
TOP VIEW
END
SECTION A-A
FRONT VIEW
Drawing board made of 7/8" clear soft pine, thoroughly dried and carefully jointed
T square to be of oak with maple edges, glued up as shown in above sketch.
MAPLE
OAK
MAPLE
Joints must be very accurately made and held with hot glue. Bore hole A before blades of square are sawed.
TOP VIEW
27 1/2"
EDGE VIEW

DETAIL OF DRAWING BOARD AND T-SQUARE.

PROBLEMS ABOUT THE SCHOOL.

Leon H. Baxter, St. Johnsbury, Vt.

All of the following problems were made by our manual training department to comply with requests from various other departments of the school, and may be of assistance to those who might be asked to construct articles of a similar nature.

Study Table.

A suitable study table, where reference books may be kept, is quite an asset in the schoolroom. The type of table shown in the next drawing proved very popular and quite a number were made for various rooms.

The top was made up of ⅞" basswood, 3'-9" wide by 6'-9" long. The boards forming the top were planed to a careful joint and held by ½" dowels, four of them being equally spaced on each pair of boards, the holes being bored 1½" deep with a No. 8 bit.

The rough dimensions of the legs were 3½"x3½"x28½". Six inches from the top end the legs were planed so as to taper to 1¾" square at the bottom.

The two long rails were made ⅞"x5"x5'-11", and the end rails ⅞"x5"x36".

All rails had a tenon cut on the ends to the dimensions shown in detail. Mortises to match the tenons were cut at the top of the legs.

Four corner braces, ⅞"x4"x9" with ends cut at 45 degrees were made and holes bored and countersunk for screws.

Two strips 1"x1"x5'-6" and two 1"x1"x30" were cut and screw holes bored and countersunk, as shown in sketch. These were to be secured close to top edge of the rails and then screwed to the underside of the top itself.

All joinery was done with hot glue and all parts securely clamped overnight.

After the clamps were removed all extra glue was carefully chipped off and the top attached with 1½" No. 8 flat head screws. The corner braces were screwed on as indicated in the sketch.

It was then thoroly sanded and given a priming coat of paint. After this was thoroly dry, it was sanded with No. 0 sandpaper and a finish coat of desired color was applied. Gray is a very good color to use as it is neutral and shows the dirt and wear but slightly.

Music Stand.

At the request of the music supervisor, a number of adjustable music stands were made for various schools. The design shown in the next drawing was used and the stands have proven very successful.

The outside shaft is first made up of ⅞" oak, two pieces being 2½"x36" and two 1½"x36". These were glued together with hot glue and securely clamped with eight wooden hand clamps so that the inside dimension was 1½" square.

The inside shaft is solid 1⅜" square by 29" long. The top is rounded and a slot cut at the top ⅜" wide and 1¾" deep. A hole is bored from side to side ⅜" in diameter and ¾" from the top.

Strips of oak ¼" thick by ½" wide are cut and mitered at 45 degrees to fit on top of the outside shaft and are held with glue and ½" brads.

The sub-base is ⅞"x4½"x4½" and is held to outside shaft with glue and 1½" flat head screws. The location of the screw holes is shown in the drawing of the sub-base.

The base is ⅞"x10"x10" and is held to sub-base by 1½" screws put in from the under side at places shown in drawing.

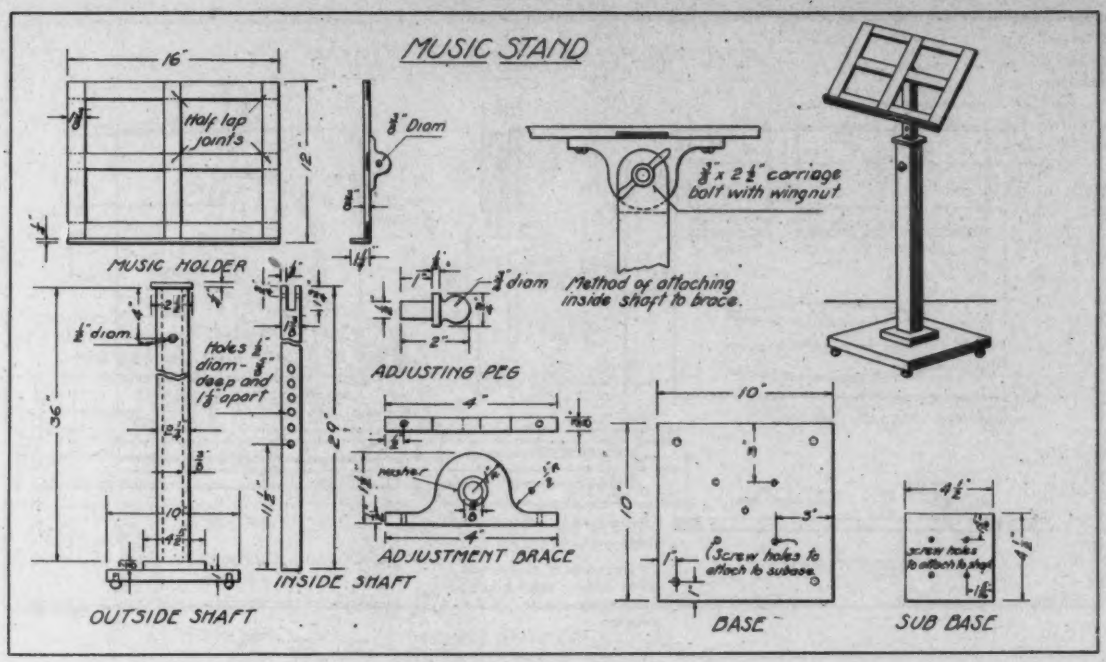
Four turned pieces for the legs are made on the lathe, similar to the drawing of the adjusting peg, with the exception that the dowel piece that enters the base should be ⅜" for the legs instead of 1".

Make the adjusting peg next, to size shown, and bore the hole to receive same in the outside shaft with No. 8 bit, 4" down from the top.

The music holder is made up of ⅞" oak in strips 1⅜" wide. Three pieces are made 12" long and three 16" long and all joints are half-lap as indicated. A strip ¼"x1¼"x16" is made and attached to the bottom edge of the holder by means of glue and ½" brads. All joints are held with hot glue and securely clamped.

The brace is made up ⅞"x1½"x4" and cut to shape shown in detail. A ⅜" hole is bored 1" from the rounded edge, in the center, and two small holes for screws ¼" from the ends. This is glued and screwed to the middle slat of the holder with ½" round head blue screws.

The holder is held to the inner shaft by means of a ⅜"x2½" carriage bolt with a washer and wing nut as shown.



DETAIL OF MUSIC STAND.

Holes are bored with a No. 8 bit, ⅝" deep and 1¼" apart on centers, starting 11¼" from the bottom of shaft. These engage with the adjusting peg to raise or lower to desired height.

All parts are sanded absolutely smooth and stained with Johnson Wood Dye, No. 125 Mission. Three successive coats of shellac are applied on different days, the first two being rubbed down when dry with No. 00 sandpaper and the last coat with ground pumice and oil.

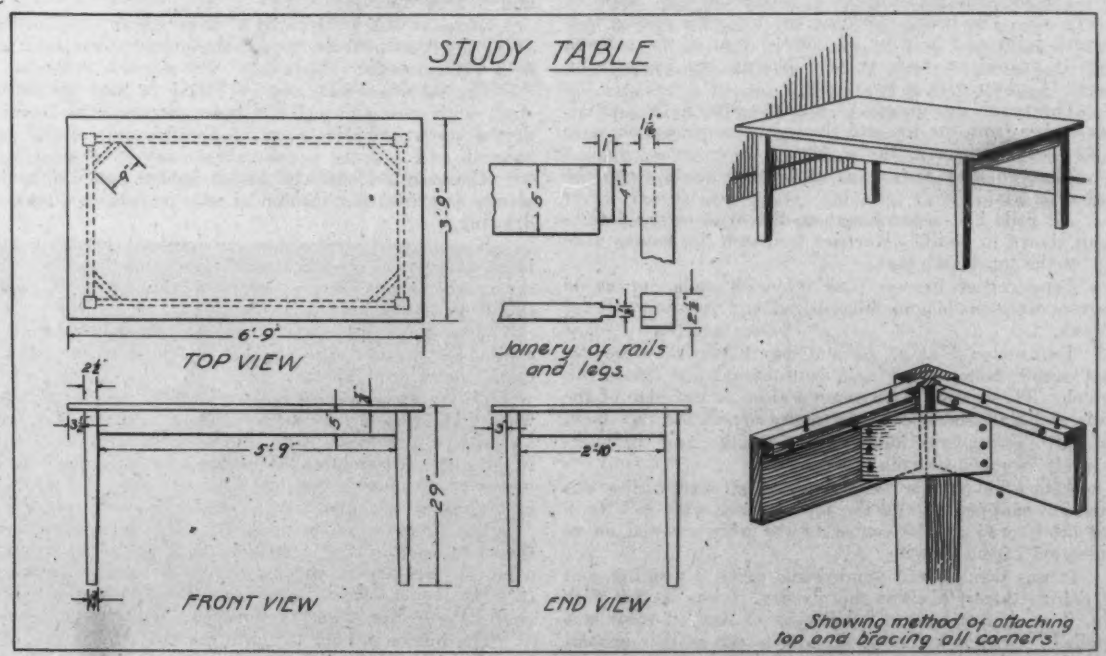
Drawing Board and T Square.

About three dozen drawing boards and T squares were made for use in the Junior High School drafting room and formed a most interesting and worth while problem.

The main part of the drawing boards was made ⅞"x17½"x22". Soft pine is the best material to use and the pieces should be carefully jointed and doweled together with ⅜" wide dowels, the holes being bored with a No. 8 bit, 1" deep, and each pair of boards used in the construction should be joined with three dowels evenly spaced.

The strips, or cleats, ¾"x1½"x17½", are made for reinforcing the boards at the ends.

Slots are bored with a No. 6 bit, 1" deep and 1¼" long as shown on the drawing. These are 2" from the ends of the cleats. A shoulder is cut in the edge of each cleat on one side, ¼" high and ½" wide. This fits into a corresponding groove cut in the ends of the drawing



DETAIL OF TABLE FOR STUDY PURPOSES.

board. These grooves are 11/16" deep and ¼" wide. The extra sixteenth in the depth of the groove over the height of the shoulder or tenon is to allow for shrinkage or swelling.

Round head blue screws, 1½" No. 8 are set in the slots for the cleats previously bored, slipping them thru a 3/16" washer.

No glue is used in attaching the cleats as after being fitted into the groove, iron clamps are put on and while thus clamped the screws are firmly set in. The idea is to allow for shrinkage and expansion in the board which is taken care of by the slot and shoulder.

The surfaces are carefully sanded, first with No. 1 and afterward No. 00 sandpaper. The edges are all made square and true.

The squares are first built up of oak with maple edges. A piece of oak 1¾" thick and 4" wide is squared up and pieces of ¼" maple 4" wide is glued to the oak on its 4" sides with hot glue only. The pieces are 27½" long. At least ten wooden clamps should be used in clamping these up and care should be taken to see that there is an even pressure thruout. The hole shown in the drawing, by which the squares are hung up, are now bored, using a No. 6 bit and locating the same in the center of the square 1¼" from the end.

Plane the top surface smooth, and if possible, run the stock thru a circular saw to a thickness of 3/16". These blades are next planed on both surfaces so that the finished piece is ¼" thick.

The maple edges must be planed absolutely straight and square. Locate five holes in the end of the square to receive the screws for attaching to the head. These are countersunk.

The head of the square is ⅜"x2"x11¼" and made of oak. The heads are shaped with a freehand curve, balancing on each side, as shown in the drawing.

These are attached to the blade by ¾" No. 2 flat head brass screws. Considerable care must be taken to get the blade and edge of square at exactly right angles, or 90 degrees, with each other.

The squares should next be oiled with linseed oil rubbed in, and after drying 24 hours, two successive coats of shellac (white) applied, the first being rubbed down with No. 0 sandpaper and the last with ground pumice stone and oil.

ADJUSTABLE BAG-HOLDER.

Robert H. Smith, State School of Agriculture, Canton, New York.

The use of grain as feed is universal on farms whether poultry farming, dairy farming or general purpose farming is carried on. In feeding it is seldom used as bought but is mixed to form the ration in use and after this mixing process it is rebagged in order that it may be more conveniently handled. This makes the bag holder shown an interesting project for the farm boy—it has a place and utility on the farm. In addition to the interest created it has many other features that make it good as a shop exercise.

1. While not too difficult its construction involves the use of, and gives practice in handling, a number of tools common to the farm shop.

2. It readily adapts itself to construction by a group of boys or by a single student who wishes it for use on the home farm.

3. Its construction does not call for the use of expensive materials as it can be largely made from small pieces that might otherwise be thrown away.

4. While made adjustable in both height and width enabling it to care for any size sack, the same principle may be used and the work simplified by making it non-adjustable.

Material List.

Lumber.

No. Pieces Required.	Finished Size.	Where Used and Drawing No.
2	1 foot 3" x 2¾" x 1¾"	Sills numbers 4 and 7.
2	1 foot 6" x 7¼" x 13/16"	Floor boards No. 8.
2	4 feet 0" x 6 " x ⅛"	Uprights No. 9.
2	6" x 1½" x 13/16" (hardwood)	Cross pieces at base of uprights No. 10.
2	5⅛" x 1½" x 13/16"	Cross pieces near center of uprights No. 11.
1	6" x 1½" x 13/16"	Cross piece on extension bar No. 12.
1	1 foot 6" x 6" x 13/16"	Extension bar No. 2.
1	6" x 1¾" x 1¾"	Support for right hand upright No. 13.
2	1 foot 2½" x 13/16" x 13/16"	Guides for extension bar No. 1.
2	5½" x 3" x 1⅞" (maple or birch)	Guides for holding jaws No. 6.
2	9" x 3¼" x 1¾"	Holding jaws No. 5.

Hardware.

10 2"—No. 10 F. H. B. screws for base.

12 1"—No. 7 F. H. B. screws for holding jaws assembly No. 5 and No. 6 and upright center cross piece No. 11.

4 3¼" x ¼" carriage bolts with washers for bolting uprights to base.

2 2¾" x ¼" carriage bolts for joining support block No. 13 to extension slide No. 2.

1 3" x ⅜" carriage bolt with ½" washer beneath head and ⅜" washer for threaded end for left hand end of extension board No. 2 to slide in slot No. 4.

Small quantity of 3D and 6D nails.

½ pint of floor oil or paint oil.

Construction and Assembly.

1. Select a springy, straight-grained piece of ¼" material that will dress 6" wide and cut from it a piece 4'-1" long from which to make upright No. 9. The extra inch is left for squaring after the edges are jointed.

2. Joint the edges making the piece just 6" wide.

3. Square one end, removing but a small amount of wood. Test for accuracy. If inaccurate, square again and re-cut.

4. From this finished end measure off 1'-10" and square a second line across the piece. The extremities of this line locate the points where the taper starts for the upper end of the upright.

5. At a point 2'-8" from the finished end, square a second line across locating the upper edge of the center cross piece No. 11.

6. Measure 4'-0" from the finished end, and square a third line across the piece locating the top of the upright.

7. Gauge a center line down the top of the upright and with a center located in this line and a radius of 2" describe a circle touching the line squared across the top.

(Note): Top may be finished with obtuse angle if desired instead of circle.

8. From the extremities of the second line squared across the upright, draw straight lines tangent to the circle described at the top. This gives the desired slant for the taper.

9. At a distance of 2'-8¼" from the finished end, locate a point in the center line just made. This is to serve as a center for an inch hole which forms the base of the slot in the upright.

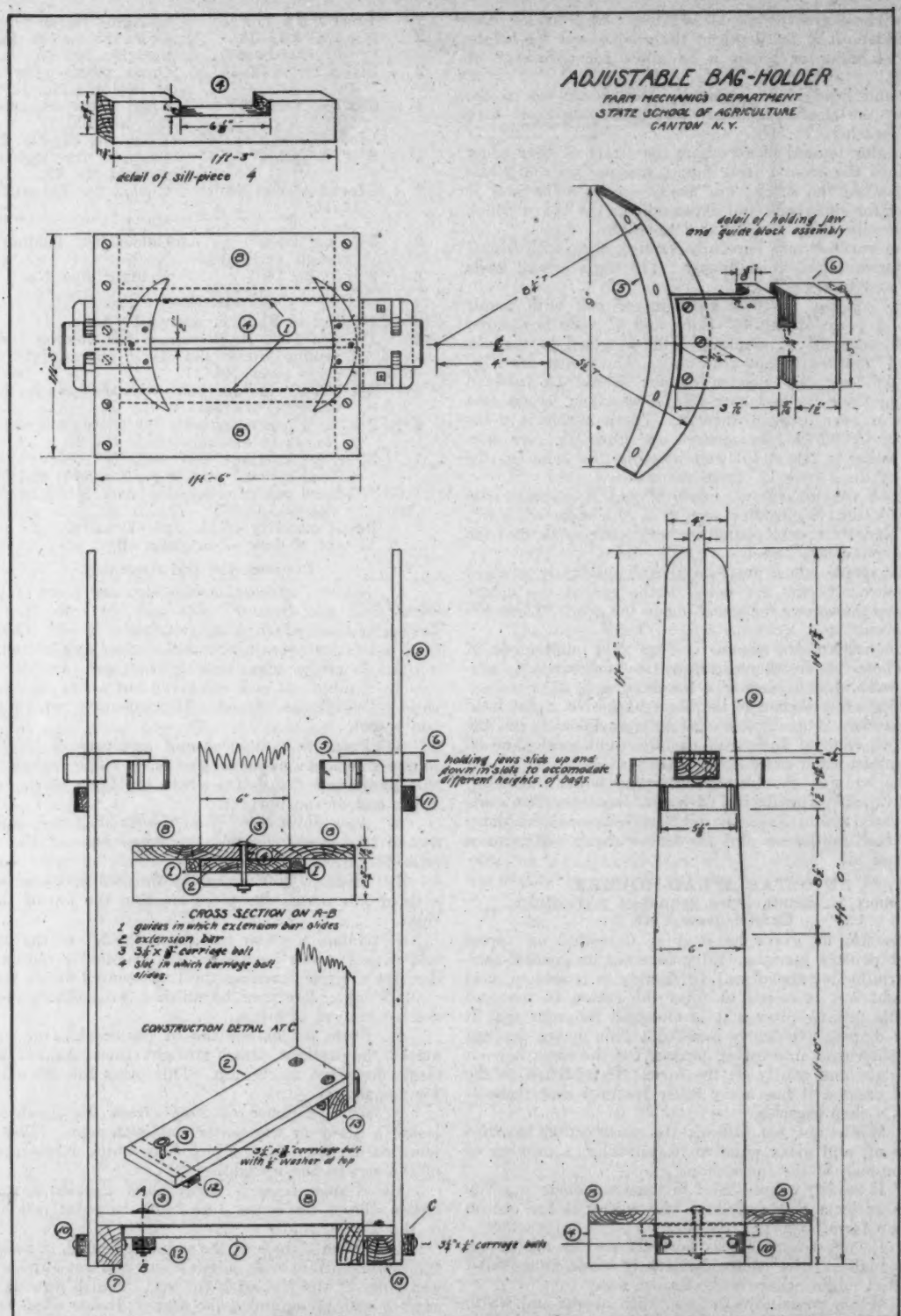
10. Gauge lines 1" apart and equally spaced on either side of the center line from the point just located to the top.

11. Bore 1" hole at the point indicated, cut curve at the top of upright with compass saw and cut outside taper and sides of the slot with rip saw. Finish outside edges smooth with plane and spoke shave. Inside edges may be smoothed with wood rasp.

12. Construct second upright same as one just made.

13. Select a piece of 13/16" pine or basswood and make two center cross pieces 5½" long and 1½" wide with corners rounded as indicated on drawing No. 11.

14. By means of 1" screws driven from the inside fasten these pieces squarely across the upright at the base of the slot in the upper end at the point previously located.


ADJUSTABLE BAG-HOLDER
FARM MECHANICS DEPARTMENT
STATE SCHOOL OF AGRICULTURE
CANTON N.Y.
detail of sill-piece 4
detail of holding jaw and guide block assembly
holding jaws slide up and down in slots to accomodate different heights of bags
CROSS SECTION ON A-B
1 guides in which extension bar slides
2 extension bar
3 3½" x ⅜" carriage bolt
4 slot in which carriage bolt slides.
CONSTRUCTION DETAIL AT C
3½" x ⅜" carriage bolt with ½" washer at top
3½" x ½" carriage bolt

DETAILS OF BAG HOLDER FOR FARM USE.

15. From a piece of 13/16" hardwood make two bottom clamps No. 10, 6" long by 1½" wide and with rounded corners as shown.

16. From elm or other tough wood cut a block 1¾" x 1¾" square and 6" long. This is shown as number 13 in the construction detail of joint "C" and serves as a foundation for the right hand upright.

17. Construct the extension board from 13/16" lumber 1'-6" long by 6" wide. This is shown as piece No. 2 in construction detail at "C". Make and nail the strengthening cleat No. 12 across the inner end of the extension board as shown. Bore ⅜" hole for carriage bolt No. 3.

18. Assemble right hand upright and extension

CHART SHOWING STUDENTS AND TIME THEY ARE RESPONSIBLE FOR THE DUTIES CONNECTED WITH SHOP WORK COURSES

WORK BENCHES	TOOL ROOM	FINISHING ROOM	CHECKING BENCH SQUARES	CLAMPS-GLUE SCRAP BOXES	SURFACER	JOINTER	CIR.-SAW	BAND SAW	MORTISER	SANDER	REPAIR WORK	SPECIAL

AN ORGANIZATION CHART WHICH IS HELPFUL.

board as shown in construction detail using ¼" carriage bolts with washers beneath nuts.

19. Cut two pieces 1'-3" long by 2¾" wide by 1¾" thick for sills, numbers 7 and 4. Sill No. 7 for left end is left in this shape. Sill No. 4 for right end has gain cut in upper surface as shown in detail of No. 4.

20. Dress two pieces of 13/16" material, 1'-6" long by 7¼" wide with squared ends to serve as floor boards, No. 8.

21. Fasten floor boards to left hand sill No. 7, with 2" No. 10 F. H. B. screws leaving a ½" slot in the center.

22. Place right hand assembly of upright and extension board in position and fasten right hand sill No. 4 in place using 4-2" No. 10 F. H. B. screws.

23. Place ⅜" carriage bolt thru slot in floor and hole in extension board. Bolt No. 3 should have ½" washer at the top and ⅜" washer at the bottom.

24. Cut two pieces of 13/16" square material of the proper length to reach from sill to sill beneath the floor boards. These are to serve as guides No. 1. Nail them in place on either side of the extension board. Extension board should now slide freely in and out. If it does not adjust until this condition is secured.

25. Bolt left-hand upright in position using ¼" carriage bolts with washers.

26. From cardboard, stiff paper or tin construct a template for cutting out the holding jaws, using centers and distances as given on the detail of No. 5.

27. Place this template on a piece of tough straight grained material, 1¾" thick with the grain running lengthwise of the template and mark around the template laying out the form of the jaw on the wood. (Note): If desired these jaws may be made from a piece of straight 13/16" material. This simplifies the work but does not give as good an appearance as the curved jaw does.

28. Cut these jaws to shape. This can best be done by making saw kerfs at right angles to the edge of the piece and extending down to the curved outline of the jaw, the saw kerfs being about ¾" apart. The waste wood is then removed with a chisel and the piece smoothed up with the spoke shave. Nails are put thru from the inside as indicated and filed sharp to provide hooks for holding the bag.

29. On a piece of hardwood, maple or birch, 1¾" thick by 3" wide lay out the mortises as shown in the detail No. 6. The curve on the under side of this piece may be constructed in the manner outlined for the jaw or an inch hole may be bored thru at the proper point and the horizontal and vertical saw cuts connected into it. If the hole is used it should be laid out and bored from both sides, the work being afterward smoothed in the curve with the rasp.

30. Attach guides No. 6 to jaws No. 5 with 1" No. 7 F. H. B. screws. They should work freely in the slots of the uprights.

31. Holes may be bored in the upright and a pin attached to a string provided on each side for holding the jaws at the proper height to accommodate the bag in use if desired. This was done on the first one constructed and found unnecessary, the tension of the uprights pulling against the open mouth of the sack being sufficient to keep the jaws from slipping down.

32. The device should be given several coats of floor oil or linseed oil and turpentine. This will tend to prevent shrinking and swelling.

Operation.

In use the uprights are pulled apart to the proper distance to take the sack being used. The tops are then sprung together and the top of the bag placed over the holding jaws. These are then permitted to spring apart holding the mouth of the sack open. The holding jaws are then moved up the uprights to the proper height.

AN EFFECTIVE DUTY CHART.

C. V. Denman, San Marcos, Texas.

Is your shop properly organized? Are you getting the greatest amount of efficiency for the least amount of effort? These are some of the questions we should ask ourselves as teachers of shop courses. Perhaps you may be overworking some willing student while another may not be getting all the training he should be receiving.

The charts accompanying this article may seem simple but it is often true that the simple things are the ones which work best and we are least apt to think of. The writer has found charts 1 and 2 especially helpful because it places a definite responsibility upon a definite student. Students are usually willing to carry out a reasonable assignment when they know definitely what that assignment is, and seeing their names on a chart impresses the fact upon them that they are being held responsible.

Many shops practice the plan of having the last operator at a machine take time to brush it clean. With this plan there is no definite method of checking, the necessary duties may be performed and again they may be left for the instructor to perform.

The blank squares on the large duty chart are 1"x1¼", sufficiently large to enter the name of a student from each class reporting to the shop. The oiling chart may seem to some to be in part a duplicate of the general duty chart but it can hardly be dispensed with. Anyone adopting these charts will probably need to change them somewhat to meet local conditions but such a system is convenient and will repay you many times for the trouble of working up tracings for prints.

THE ATLANTIC CITY CONVENTION.

That vocational education is still in the promotional stage and that its problems are still so new that theories as well as practice are changing with great rapidity, was evidenced at the Atlantic City meeting of the National Society for Vocational Education. The program prepared by Mr. Wm. J. Bogan of Chicago, approached the subject of vocational schools from the practical standpoint of the administrator who is engaged in introducing the work into the several states and local communities. The meetings were well attended and the enrollment was slightly larger than it has been in previous years. On the second and third days there were present many superintendents of schools who came in advance of the meeting of the Department of Superintendence.

The first day was devoted entirely to problems arising in the part-time or continuation school. It was made very plain that for the present, the continuation school must provide opportunities for review and drill in fundamental subjects, and for advanced work for those pupils who have received a grounding that will permit them to apply these subjects to the experiences of life. The schools must help the children to analyze their present jobs and the jobs which they will undertake later in life. The schools must be the place of vocational counsel and guidance and they must provide rich opportunities for prevocational shop experience. To make the child efficient in his present temporary job is important, but it is of far greater importance to prepare him for the job which will be the permanent lifework.

The speakers of the day included Mr. W. A. O'Leary who spoke on "Vocational Efficiency in Industry As Resulting from the Part-Time School," and Mr. O. D. Evans who took up the specific functions and organization of urban continuation schools. The specific problems of developing units of instruction and short courses were handled by Mr. Oakley Furney of New York City, and suggestions for making the instruction of permanent vocational value were given by Mr. E. A. Wreidt of Indiana.

The sectional meetings in the afternoon took up the agricultural, commercial, industrial and home making aspects of the subject. The problems of training foremen were discussed at length by Mr. Arthur L. Mann of the Eastman Kodak Company and by Mr. James Cronin of the Pennsylvania Department of Labor. A reception was given on Thursday evening at which Mr. James P. Munroe, Vice-Chairman of the Federal Board for Vocational Education, acted as presiding officer.

Vocational rehabilitation formed the topic for the sessions on Friday. The great success of the rehabilitation work with disabled soldiers has become the inspiration for similar work in a number of states. The federal aspect of the subject was developed by Mr. Lewis H. Carris, of the Federal Board for Vocational Education. Pennsylvania's experience showing that 1290 persons had been offered help was presented by Mr. S. S. Riddle of the Bureau of Rehabilitation for Pennsylvania. Mr. Riddle's paper indicated that 148 of those injured could not read or write English, that the bureau helped 190 to get appliances enabling them to return to work, that 80 are under training at the present time in short courses, and that 67 are receiving maintenance not exceeding $15 a week during training.

Individual attention to cases is the fundamental of success according to Mr. O. M. Sullivan, State Director for Reeducation of Injured Persons in Minnesota. The training and the vocational guidance must take into account present abilities, education, inclinations, etc. The work must tend toward bringing systematic pressure for better standards of training and for greater provision for vocational education.

The achievements of the federal government and of the several states in organizing Smith-Hughes work were presented to the convention by a group of speakers including Mr. Uel W. Lamkin, Director of the Federal Board for Vocational Education, Mr. F. N. Kirkham of Utah, and Mr. L. J. Syndell of Kentucky.

ARTHUR B. MAYS,
University of Illinois, Champaign, Ill.

One of the strong speakers of the convention was Dr. C. A. Prosser, who discussed "Fundamental Principles of Vocational Education." Speaking on vocational agriculture, Prof. David Snedden of Teachers College, New York, declared that the greatest need of America at the present time is for practical agricultural schools of secondary grade. He held that half-time and full-time schools must continue to greatly increase The training must be practical and no concessions in the direction of academic studies, must be made because of college credits.

The following officers were elected:

President, Lewis A. Wilson, Director of the Division of Vocational Education, Albany, N. Y.; First Vice-President, W. F. Lusk, Mississippi Agricultural College, Agricultural College, Miss.; Second Vice-President, F. G. Nichols, Assistant Director in Charge of Commercial Education, Harrisburg, Pa.; Third Vice-President, Ben W. Johnson, State Director of Vocational Education, Delaware; Fourth Vice-President, Helen Bridge, Director of Home Economics, University of Nebraska, Lincoln, Neb.; Treasurer, John Clyde Oswald, Oswald Publishing Co., New York City.

MR. MAYS GOES TO ILLINOIS.

Mr. Arthur B. Mays has given up his connection with the educational work of the army to accept an Assistant Professorship in Industrial Education in the University of Illinois. This is the position which Mr. James McKinney left to become associated with the American School of Correspondence.

For the last year, Mr. Mays has been Director of Vocational Education at Camp Travis, Texas, where one of the best pieces of vocational work in the army has been done.

Prior to his appointment to the army educational work, Mr. Mays had served for eleven years as head of the department of Industrial Education in the Sam Houston Normal Institute, the State Normal College at Huntsville, Texas.

Mr. Mays received his collegiate training at Bradley Institute, the University of Texas, Columbia University, and the Peabody Teachers College, taking his degree from the latter institution.

The first big problem at the University of Illinois which Mr. Mays will assist in solving is the problem of teacher-training for the part-time schools. Some of his work is done in teacher-training centers away from the University. At present he has classes for general continuation teachers and shop teachers in Rockford and Peoria. Besides this outside work, he has some residence classes.

Baltimore Convention of the Eastern Arts Association

Dr. E. B. Kent, Jersey City, N. J.

Each departing visitor who had partaken of Baltimore's hospitality during the Convention of the Eastern Arts Association, which was held there March 24 to 26, seemed to have much the same comment to make in leaving; that it surpassed all previous conventions in the main essentials of success; that no other meeting had ever produced such a blending of local hospitality and informal good-fellowship, of general sessions so full of inspiration and sectional conferences so full of pointed practical suggestion for the teacher on the job. Each one went homeward filled with gratitude to the President, Mr. Edward C. Emerson of the Boston Schools and his army of co-operators.

The sessions were held at the Maryland Institute, "the most beautiful art school in America," which in addition to its architectural charm proved most convenient for the requirements alike of general sessions, round-table meetings, and the various exhibits which were all brought under one roof. Too much cannot be said in praise of the effort and the success of Mr. Theodore H. Pond and Mr. Walter R. Gale of the local committee and of the work of the various sub-committees, which arranged the many happy features like the Thursday evening reception and the most delightful automobile excursion thru charming suburbs to the various points of local interest, such as the Johns Hopkins Library and the studio of Mr. Hans Schuler where the members were cordially welcomed by the sculptor himself.

The work of the program committee under the chairmanship of the vice-president, Mr. Fred P. Reagle of Montclair, was a model of coordinated diversity, and the assignment of both the Thursday and Friday afternoon sessions to the various special sections, art, industrial arts, household arts, part-time, secondary schools, etc., permitted a wide range of very practical discussion. Space here does not permit an account of these discussions or even mention of the topics themselves, though the following random selections may serve to suggest the general scope: "Placing Emphasis upon the Fundamentals in Art Education," Theodore M. Dillway, Boston; "The Organization of Junior High School Courses in Industrial Arts," Verne A. Bird, Director of Vocational Education, Utica, N. Y.; "Senior High School Courses in Industrial Arts," Frank E. Mathewson, Jersey City, N. J.; "The School Lunch from an Educational Standpoint," Miss Grace Schermerhorn, Supervisor of Cooking, New York City; "Foreman Training," J. C. Wright, Chief, Industrial Education Service, Federal Board, and "The Home Project in Homemaking Education," Miss Edith M. Thomas, State Supervisor, Raleigh, N. C. These and the many others will serve to make of the Proceedings a reference work of great value, not only to those who were unable to be at Baltimore but to the supervisor of more than one line of work distraught by the desire to attend three or four sections at the same hour.

The general sessions opened with a unique word of welcome from Dr. Henry S. West, Superintendent of Schools, Baltimore, in which he confessed that he began his teaching career as a high school art instructor, but that having taught in two years all the art he knew, he then found it necessary to seek other fields of endeavor. The address of Mr. James P. Munroe of the Federal Board was an earnest plea for a diversity of school instruction both in respect to art and industry, which should encourage individuality in all possible lines and thus reduce the tendency of our schools to become mere "mediocrity factories." At the general session of Thursday evening, Mr. Lewis A. Wilson of New York State gave a most inspiring presentation of the necessity for the continuation school, of the right of juvenile workers to the best that the continuation school may offer them, the tangible results already secured, and the far greater opportunities which are at hand in the field of part-time education. At another of the evening sessions Professor David Snedden, who had already appeared at two of the round-table meetings, spoke upon teaching of art appreciation in respect to the utilities of life, pointing out first that art education should distinguish between at least five different classes in the community and suggesting that the largest of these, the class of mere art consumers, might perhaps be trained more effectively thru what he called the "direct method," i. e., that to handle, criticize, and compare a varied assortment of say teaspoons would go further in teaching the appreciation of good design than the attempt to actually make a spoon. This direct education of the consumer had further emphasis the day following from Mr. Alvin E. Dodd, now Secretary of the National Chamber of Commerce, spoke upon "Lessons and Impressions For the Arts From Big Business."

A new feature connected with this meeting was the dinner arranged for the evening preceding the convention by Dr. William T. Bawden of the Bureau of Education, where more than forty early birds foregathered for a very stimulating discussion of how to increase the helpfulness of supervision in the industrial arts.

At the business meeting it was decided to accept the invitation of the city of Rochester, and to hold next year's convention there. There was further discussion of the present policy of meeting during the Easter vacation, with a decision to submit the question to a referendum of the entire membership.

The following officers were elected for the coming year: President, Fred P. Reagle, Montclair, N. J.; Vice-President, Miss Frances H. Bacheler, Hartford, Conn.; Secretary, M. W. Haynes, Bayonne, N. J., and Treasurer, A. H. Wentworth, New Haven, Conn.

AUTO-MECHANICS AT SACRAMENTO, CALIF.

All of the puzzling intricacies of the automoble engine are now being taught to the students in the auto-mechanics class in the Sacramento high school.

There is a capacity enrollment in the class. The course is a three-year one and the city and state pays one-half of the costs.

Old motors, transmissions, differentials and other parts are obtained for the students to work on.

They are torn down completely, then assembled and put in working order by the students themselves.

Along with this shop work, the students are instructed in mathematics and mechanical drawing. In mathematics there are problems in gear ratio, motor speed and the like. The mechanical drawing is done from blue prints and by taking measurements of certain parts. The idea of individual instruction is followed thruout.

The following is an outline of the first year's course in the order in which the subjects are taken:

I. Steering gears, all types. Purpose, operation, theory, adjustment, trouble, care and lubrication.
II. Springs, all types.
III. Axles, front, assembly and straightening.
V. Brakes, relining and adjustment.
VI. Clutches, cone and disc.
VII. Transmissions, progressive, selective and planitary.
VIII. Motors, scrapings and adjusting bearings; grinding and adjusting valves; fitting wrist pins; trimming camshafts; trimming magnetos; oiling systems.

Now, Are There Any Questions?

This department is intended for the convenience of subscribers who may have problems which trouble them. The editors will reply to questions, which they feel they can answer, and to other questions they will obtain replies from persons who are competent to answer. Letters must invariably be signed with full name of inquirer. If an answer is desired by mail, a stamped envelope should be enclosed. Address, Industrial-Arts Magazine, Milwaukee, Wis.

Marking Tools.

58. Q:—We are having trouble in our manual training department with the "loss" of tools. We have tried locks, but as a last resort we want a means by which we can mark the tools with stencil or other method, with "Kansas City," "School Board," or some appropriate way. We have tried stamping with dies but that is not satisfactory.—S. J. L.

A:—To mark tools, warm them slightly, and rub the steel with wax, or hard tallow, until a film gathers. Then scratch the letters on the wax, cutting thru to the steel. A little nitric acid poured on the writing will quickly eat out the letters. Wash off the acid and remove the wax with a hot rag, and the letters will be accurately etched.

For etching brands and marks on polished steel surfaces, such as saws, knifeblades and tools, where there are many pieces to be done alike, procure a rubber stamp with the required design, made so that the letters and figures that are to be bitten by the acid shall be depressed in the stamp. Have a plain border around the design, large enough to allow a little border of common putty to be laid around the edge of the stamped design to receive the acid. For ink, use rosin, lard, oil, turpentine and lampblack. To ¼ lb. of rosin, put 1 teaspoonful of lard oil; melt, and stir in a tablespoonful of lampblack; thoroly mix, and add enough turpentine to make it of the consistency of printer's ink when cold. Use as when stamping with ink. When the plate is stamped, place a little border of common putty around and on the edge of stamped ground. Then pour within the border enough acid mixture to cover the figure, and let it stand for a few moments, according to the depth required; then pour the acid off. Rinse the surface with clean water, take off the putty border, and clean off the ink with turpentine. Use care not to spill the acid over the polished part of the article. For the acid, 1 part nitric acid, 1 part hydrochloric acid, to 10 parts of water by measure. If the effervescence seems too active, add more water.

179. Q:—Please tell me how to finish basswood to match mahogany, finished in a natural red finish (Walter K. Schmidt's No. 708).

Please tell me how to finish red cedar chests in a dark red and obtain a French polish.

A:—It is impossible to give an absolute, definite formula for basswood, as natural red mahogany finish may vary considerably in shade, and therefore we recommend the using of what is known as red mahogany and brown mahogany. Make a separate solution of each stain, using four ounces of the powder to one gallon each of water. Then by intermixing, say, take a part of the red, and add enough brown until you get the shade you want. You can read off the graduate, the proportion of the powder to be mixed in order to obtain a stain in dry form if you so desire. If you are matching a finished piece of wood, do not judge the shade until you have given the work a coat of shellac, and you have given the water stain plenty of time to dry naturally—Walter K. Schmidt.

Cedar chests may be finished a dark red by following these directions: The best treatment for cedar is to give the wood a coat of a mixture of one part each of boiled linseed oil and turpentine, or naphtha. When this is dry it should be followed by a coat of white shellac and two coats of varnish, rubbed dull. If a waxed finish is desired, two coats of shellac will be necessary before applying the wax. The mixture of oil and turpentine will intensify the color of the wood and prevent fading. Stain would discolor the white or sapwood, and this is not usually desirable, as cedar is mostly finished natural.

I don't believe it is wise for you to attempt a French polish. It will be much better to give the chest a good varnish finish and rub it down with rotten stone and water. After this rubbing, polish it with a good oil polish.

182. Q:—I wish to put some gold bronze on gold letters in ivory goods. What preparation is the best and how should it be done?—W. M. F.

A:—Gold bronze may be applied to ivory goods with a fine camel's hair lettering brush of the proper width by using Pratt & Lambert's Pale Gold Size Japan to do the lettering and as soon as the material becomes tacky, sift on dry bronze from a piece of cheese cloth, whereupon the size will absorb it and produce a very pleasing effect. After the letters have hardened for twenty-four hours or more, they may be cleaned up by scraping gently along the outline with a safety razor blade or other equally sharp instrument.—Ralph Waring.

185. Q:—I should like the formula for a putty which can be used under a white enamel job, and which will not discolor the enamel, nor shrink when dry.

Are concave surfaces over a nail hole, filled with putty, the result of faulty putty or what?

What is used with white enamel to produce a good French Grey enamel?—F. C. R.

A:—1. A good putty for any kind of work which will not shrink or discolor an enamel job may be prepared from whiting, 2 parts, lead in oil, 1 part, and enough boiled linseed oil to make up to a very stiff putty. No wood should be puttied up until the primer coat of either varnish or flat white has been allowed to dry. The mistake is often made in puttying up underneath the priming coat in which case the wood absorbs the oil and allows the putty to shrink.

2. Concave surfaces over nail holes puttied up result either from absorption of the oil from the putty by the wood as mentioned above or because of the fact that the putty was too soft and therefore gradually settled into the hole. Putty for this work should be quite stiff and should be cut off clean at the surface with a knife while held down under pressure of the thumb.

3. White enamel may be tinted to French grey by using a very little ivory black ground in japan. Any shade of enamel may be reached by tinting with japan ground colors which can be most economically purchased in artists' tubes as prepared for pallette work. With this form the tube colors do not dry up and waste and are the purest and most brilliant shades obtainable. Be particular as to securing japan colors since the oil ground colors slow up the enamel and retard its drying.—Ralph J. Waring.

Tests in Cotton Culture. Under the direction of Mr. W. M. Ellison, teacher of agriculture, and Mr. Richardson, county farm demonstrator, the schools of Brownsville, Tex., will carry on some practical tests in the breeding of Durango cotton, a staple variety which has proved well adapted to the section. Some experiments in budding and grafting of varieties of citrous fruits, as well as studies in potato culture, are planned. Each boy is given a plot of ground and is held responsible for the results. The section around Brownsville has a semi-tropical climate and fruits and winter vegetables thrive well.

Course in Job Analysis. State Supt. A. O. Thomas of Maine, in cooperation with Supt. T. C. Morrill of Bangor, has introduced a course in job analysis for industrial teachers. Two afternoons each week are given to the work, with the aid of a special teacher of the trades and industries. The course aims to offer the teachers the knowledge necessary to the analysis of a job, making it possible to present it in better shape to the pupil. The method of presentation is that used so successfully in the shipbuilding industry and the teachers have become enthused over the work.

Shop Teaching at Bangor, Me. With the reorganization of the shop teaching in the schools, the classes are performing actual work on a productive basis. Brass and steel has been donated to the classes and students construct parts of wet pulp and paper machines. These are made under shop conditions, and the finished work is returned to the iron foundry where it is assembled with the rest of the machine. The shops are also busy on an extensive setting of scenery for a school pageant. Kindergarten equipment, book closets and general repair work are also attempted by the classes.